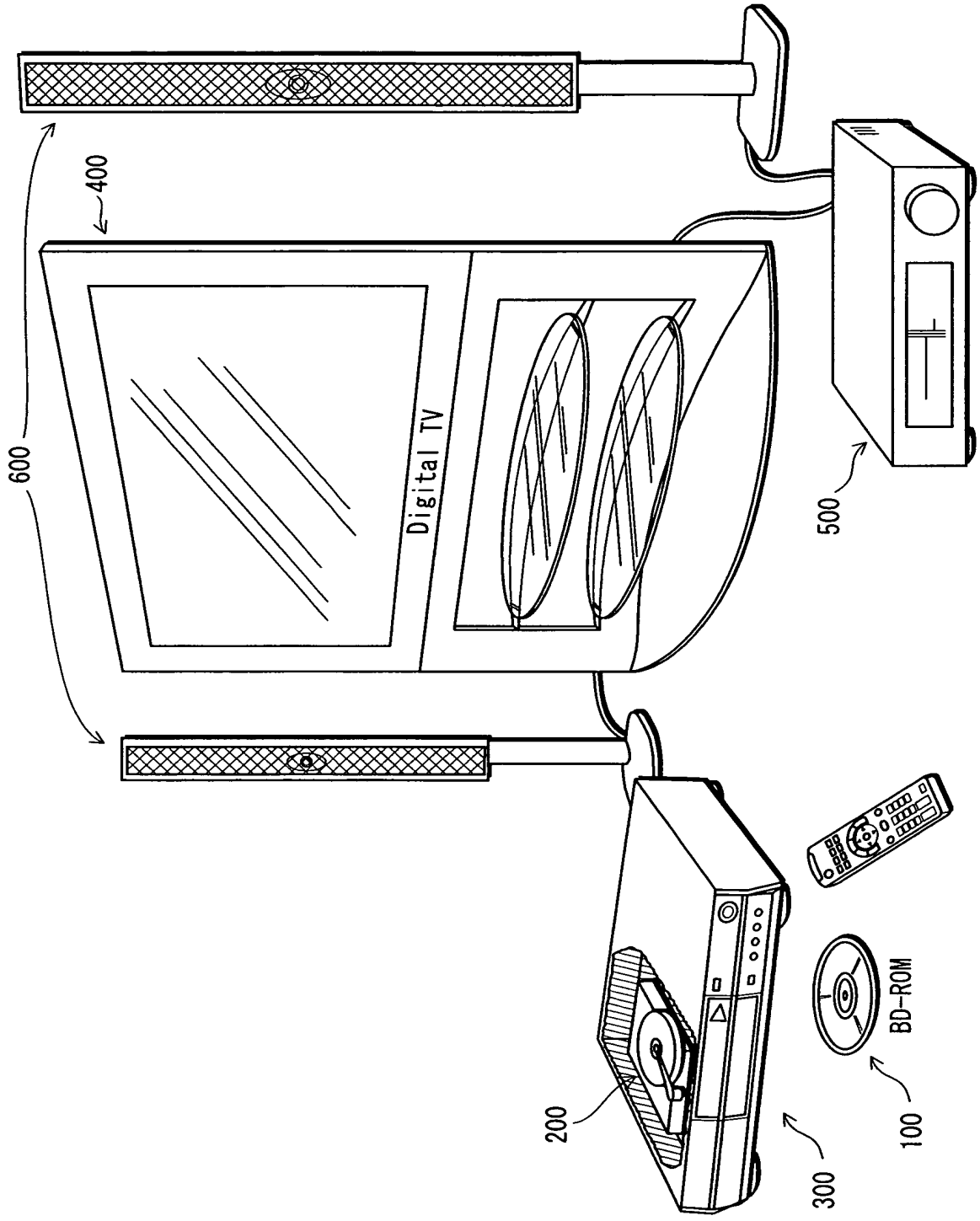

FIG. 1

FIG. 2

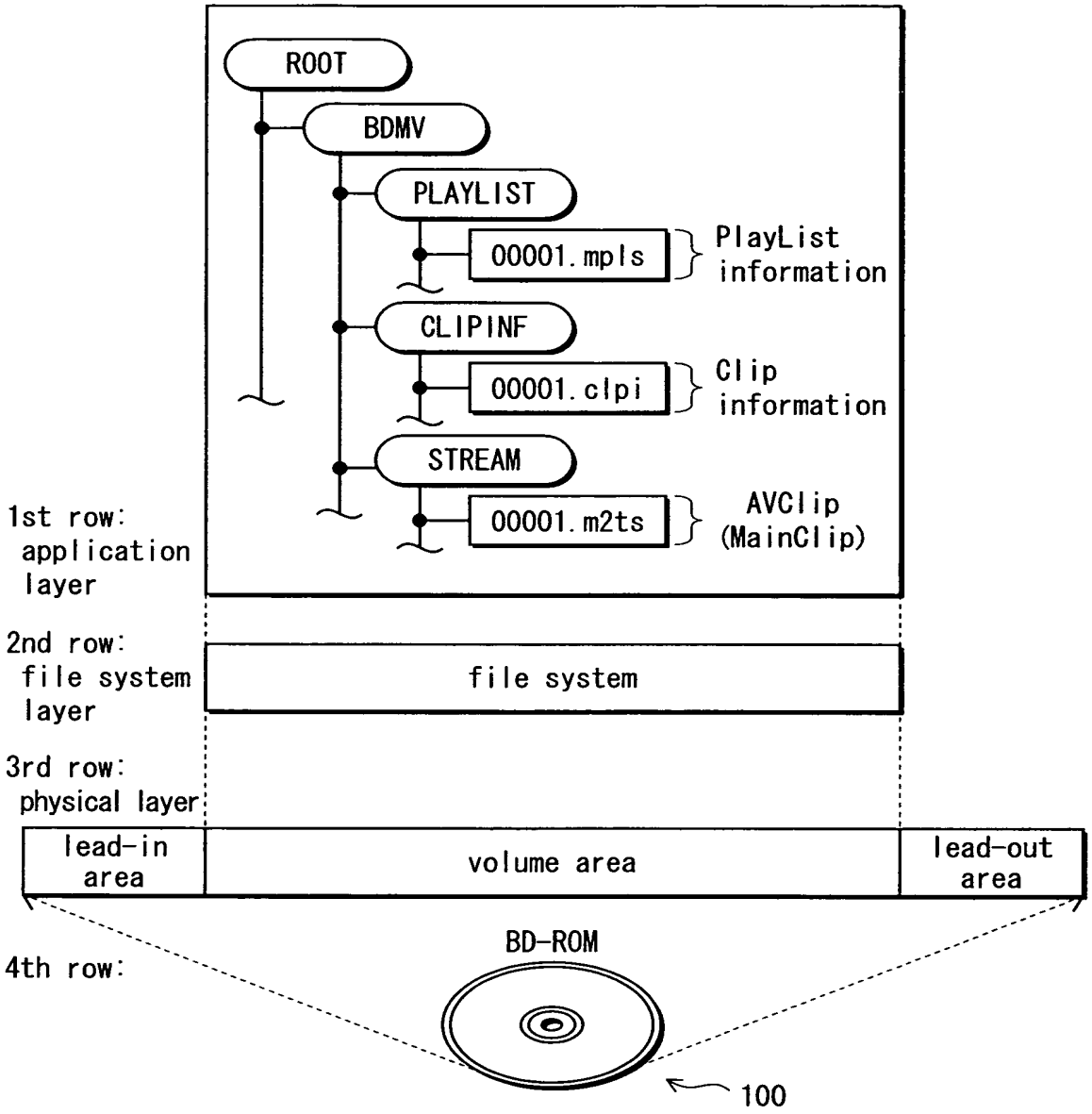
ROOT
BDMV
PLAYLIST
00001.mpls
PlayList information
CLIPINF
00001.clpi
Clip information
STREAM
00001.m2ts
AVClip (MainClip)
1st row: application layer
2nd row: file system layer
file system
3rd row: physical layer
lead-in area
volume area
lead-out area
4th row:
BD-ROM
100

FIG. 3

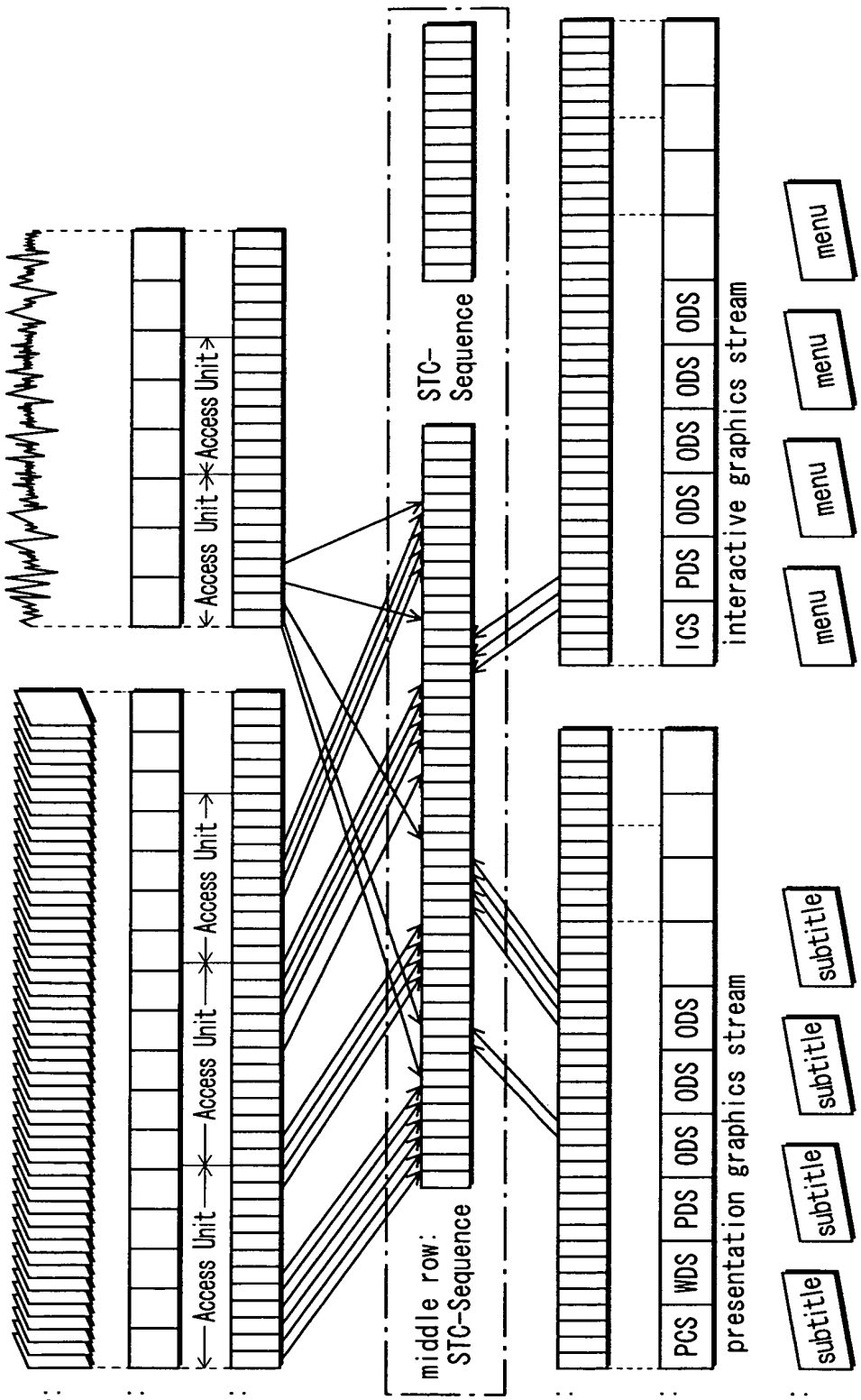
upper 1st row: AV material
upper 2nd row: PES packets
upper 3rd row: TS packets
Access Unit
middle row: STC-Sequence
STC-Sequence
lower 3rd row: TS packets
lower 2nd row: PES packets
PCS
WDS
PDS
ODS
presentation graphics stream
ICS
interactive graphics stream
lower 1st row: subtitles and menus
subtitle
menu

FIG. 4

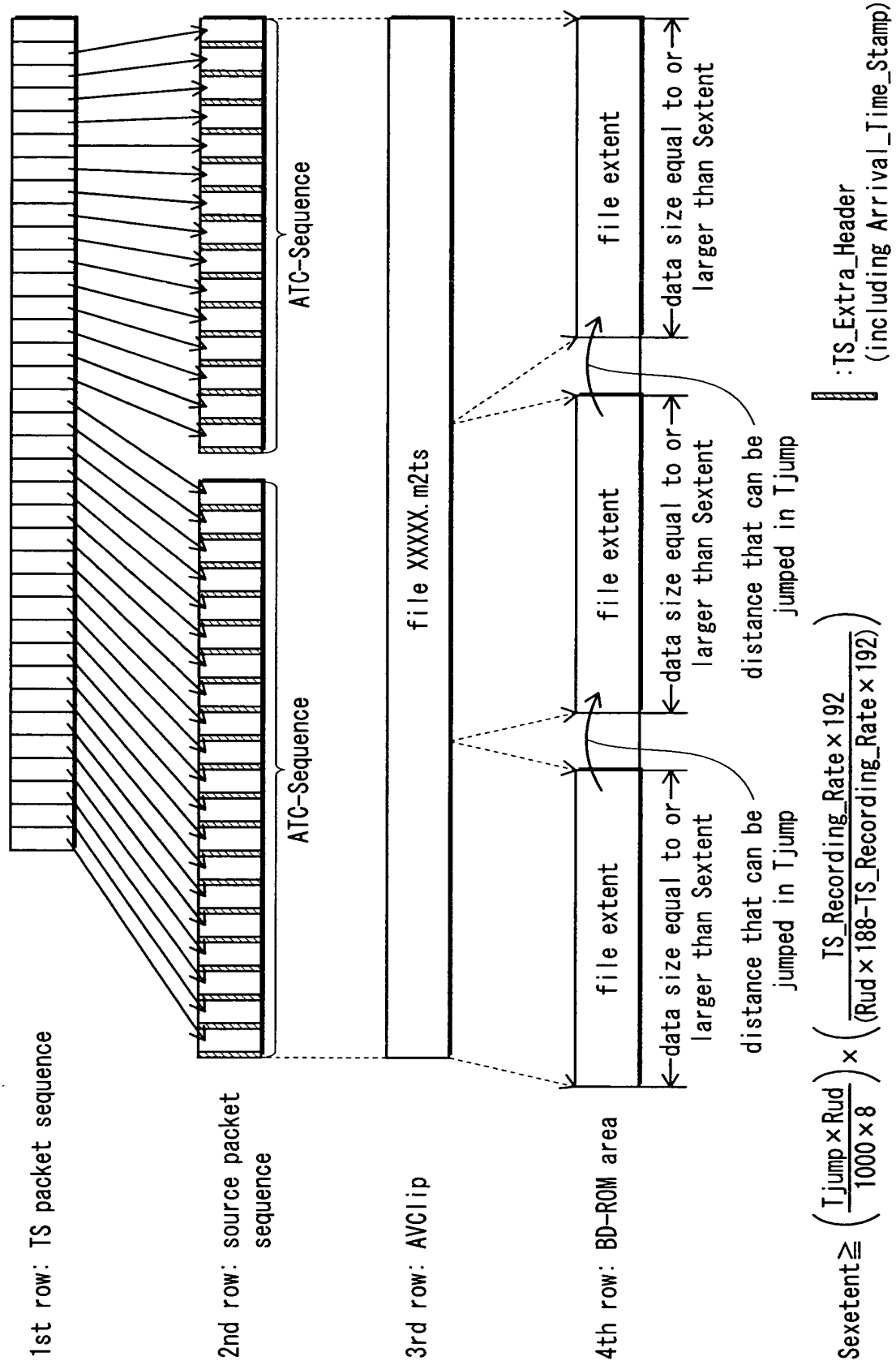
1st row: TS packet sequence
2nd row: source packet sequence
3rd row: AVClip
4th row: BD-ROM area
ATC-Sequence
ATC-Sequence
file XXXXX.m2ts
file extent
file extent
file extent
data size equal to or larger than Sextent
data size equal to or larger than Sextent
data size equal to or larger than Sextent
distance that can be jumped in Tjump
distance that can be jumped in Tjump
:TS_Extra_Header (including Arrival_Time_Stamp)
$Sexetent \geqq \left(\frac{Tjump \times Rud}{1000 \times 8}\right) \times \left(\frac{TS_Recording_Rate \times 192}{(Rud \times 188 - TS_Recording_Rate \times 192)}\right)$

FIG. 5

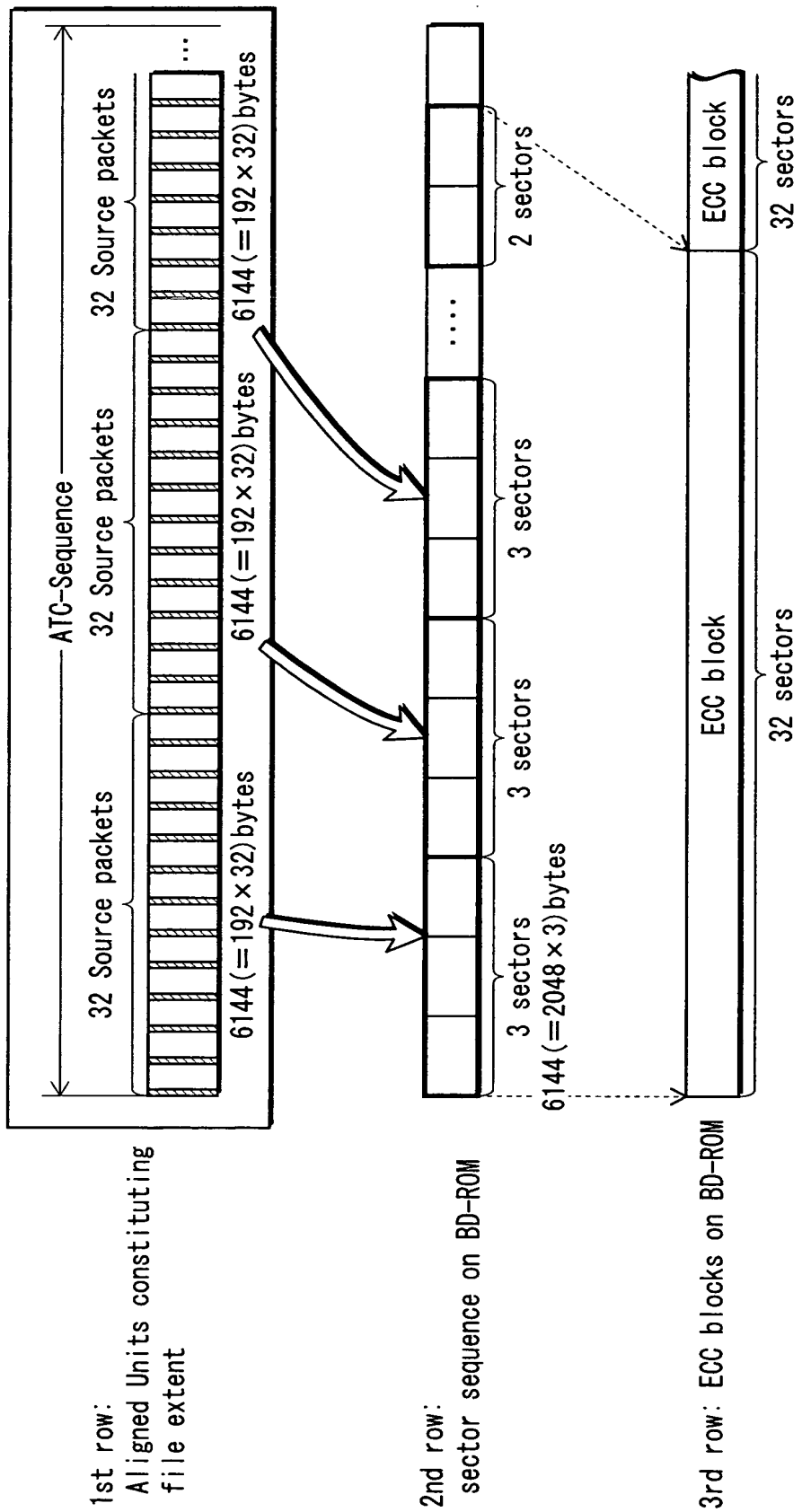
one file extent
ATC-Sequence
32 Source packets
32 Source packets
32 Source packets
...
6144 (=192 × 32) bytes
6144 (=192 × 32) bytes
6144 (=192 × 32) bytes
1st row:
Aligned Units constituting
file extent
3 sectors
3 sectors
3 sectors
2 sectors
6144 (=2048 × 3) bytes
2nd row:
sector sequence on BD-ROM
ECC block
ECC block
32 sectors
32 sectors
3rd row: ECC blocks on BD-ROM

FIG. 6

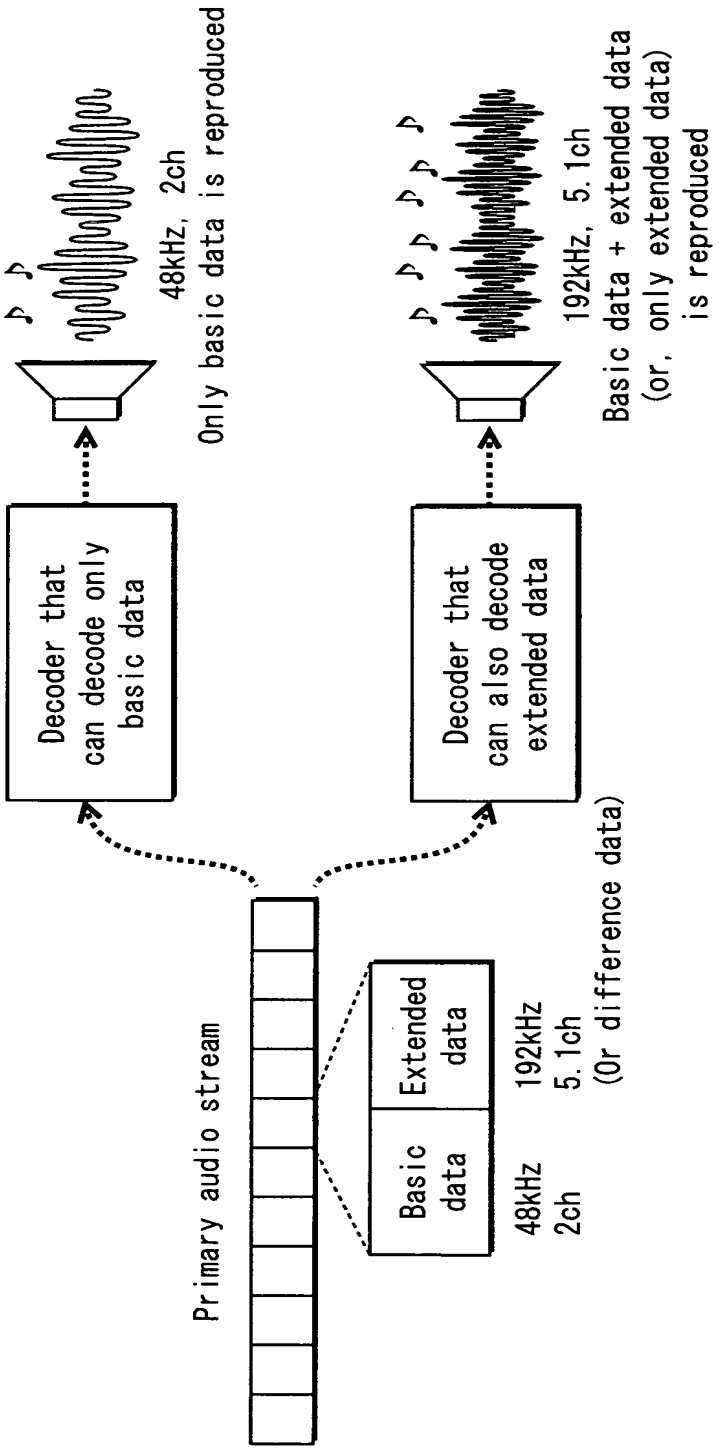
Primary audio stream
Basic data
Extended data
48kHz
2ch
192kHz
5.1ch
(Or difference data)
Decoder that can decode only basic data
Decoder that can also decode extended data
48kHz, 2ch
Only basic data is reproduced
192kHz, 5.1ch
Basic data + extended data
(or, only extended data)
is reproduced

FIG. 7

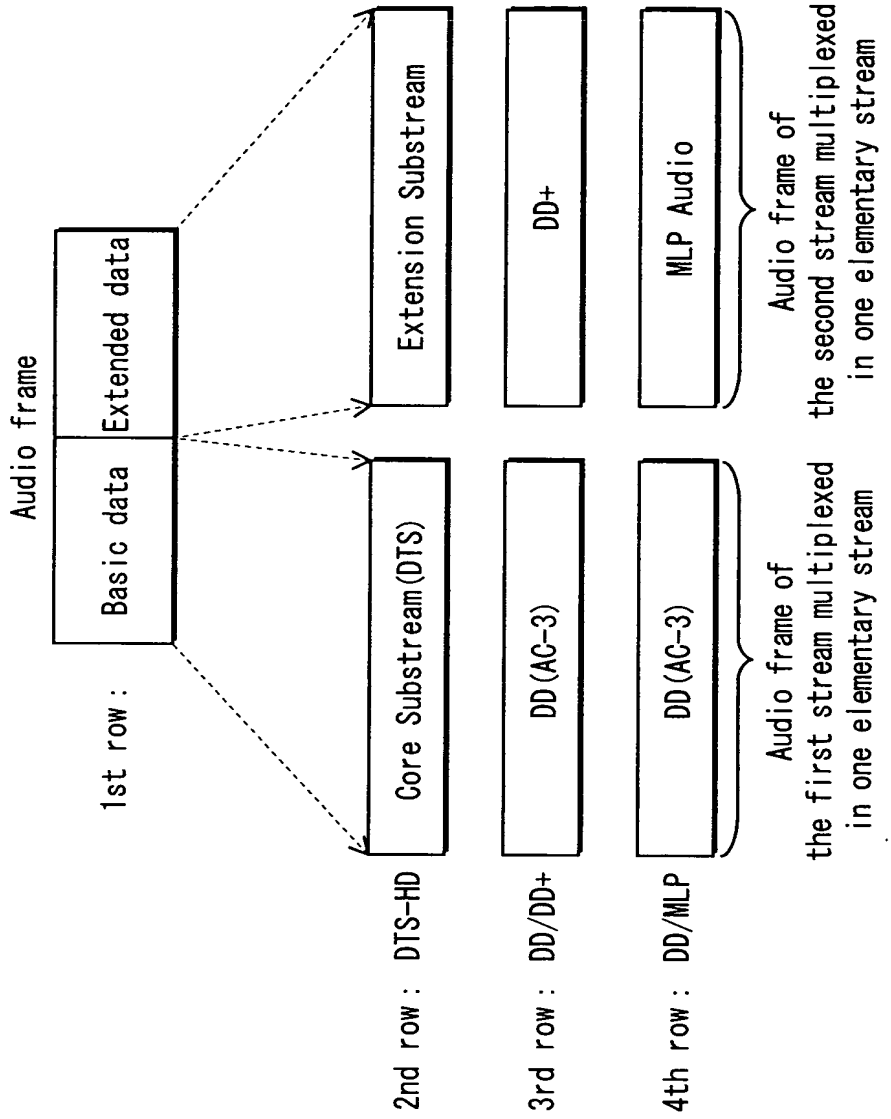
Audio frame
1st row :
Basic data
Extended data
2nd row : DTS-HD
Core Substream(DTS)
Extension Substream
3rd row : DD/DD+
DD(AC-3)
DD+
4th row : DD/MLP
DD(AC-3)
MLP Audio
Audio frame of
the first stream multiplexed
in one elementary stream
Audio frame of
the second stream multiplexed
in one elementary stream

FIG. 8

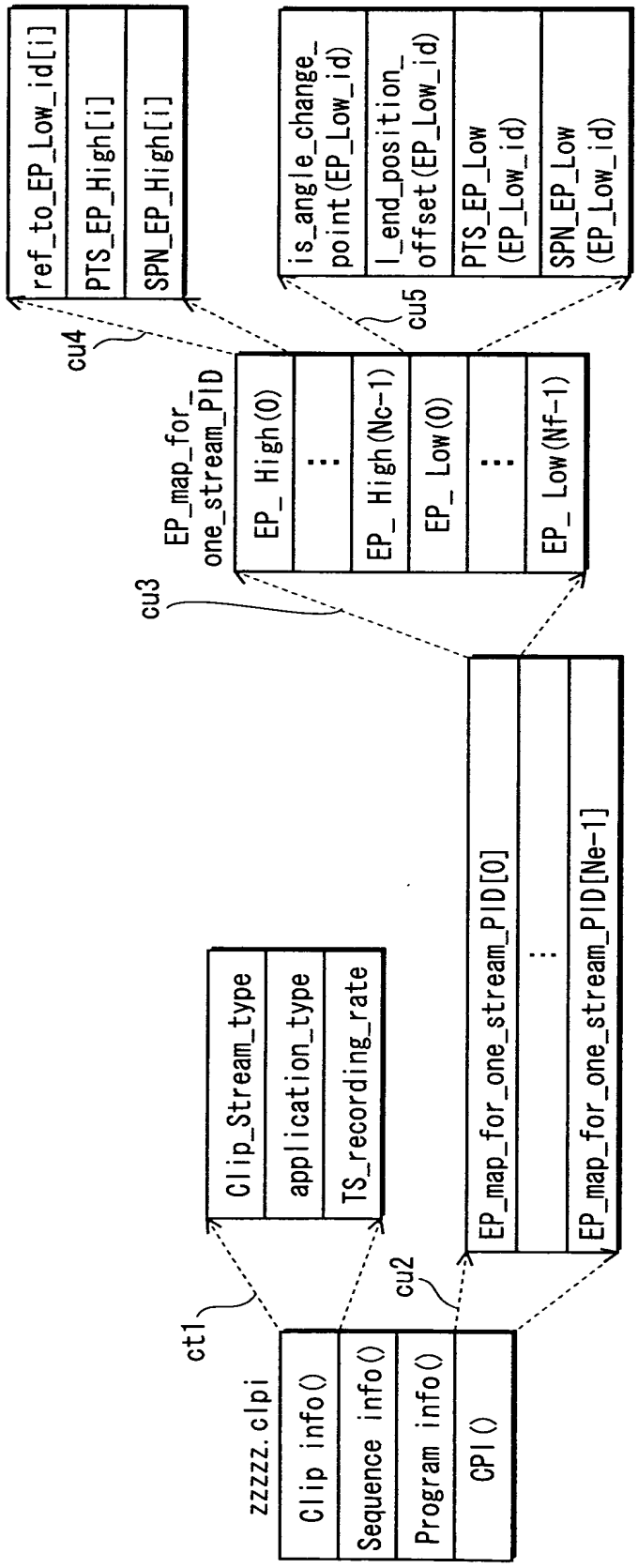
zzzzz.clpi
Clip info()
Sequence info()
Program info()
CPI()
ct1
cu2
Clip_Stream_type
application_type
TS_recording_rate
EP_map_for_one_stream_PID[0]
EP_map_for_one_stream_PID[Ne-1]
cu3
EP_map_for_one_stream_PID
EP_ High(0)
EP_ High(Nc-1)
EP_ Low(0)
EP_ Low(Nf-1)
cu4
ref_to_EP_Low_id[i]
PTS_EP_High[i]
SPN_EP_High[i]
cu5
is_angle_change_point(EP_Low_id)
I_end_position_offset(EP_Low_id)
PTS_EP_Low (EP_Low_id)
SPN_EP_Low (EP_Low_id)

FIG. 9

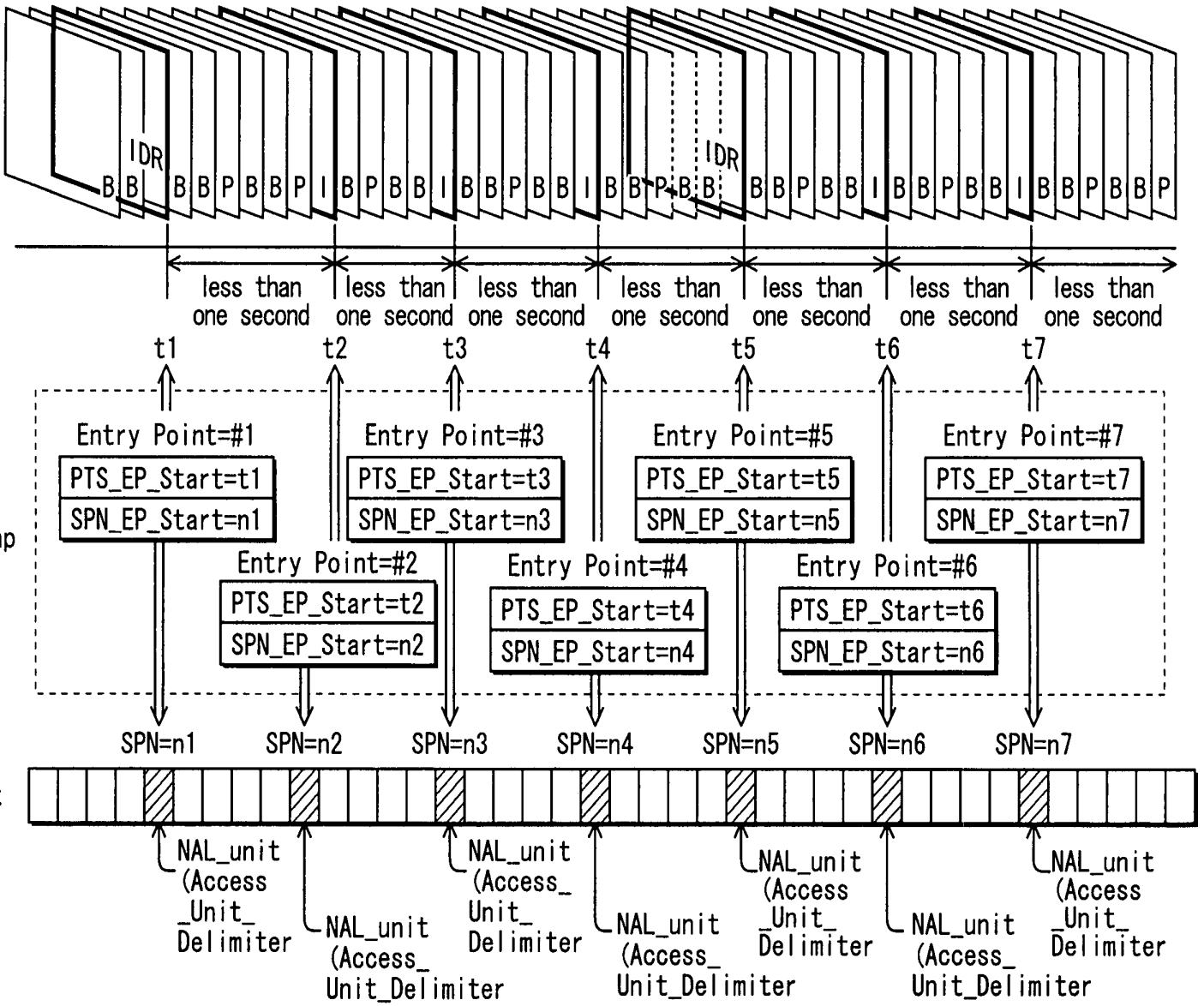

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FIG. 10

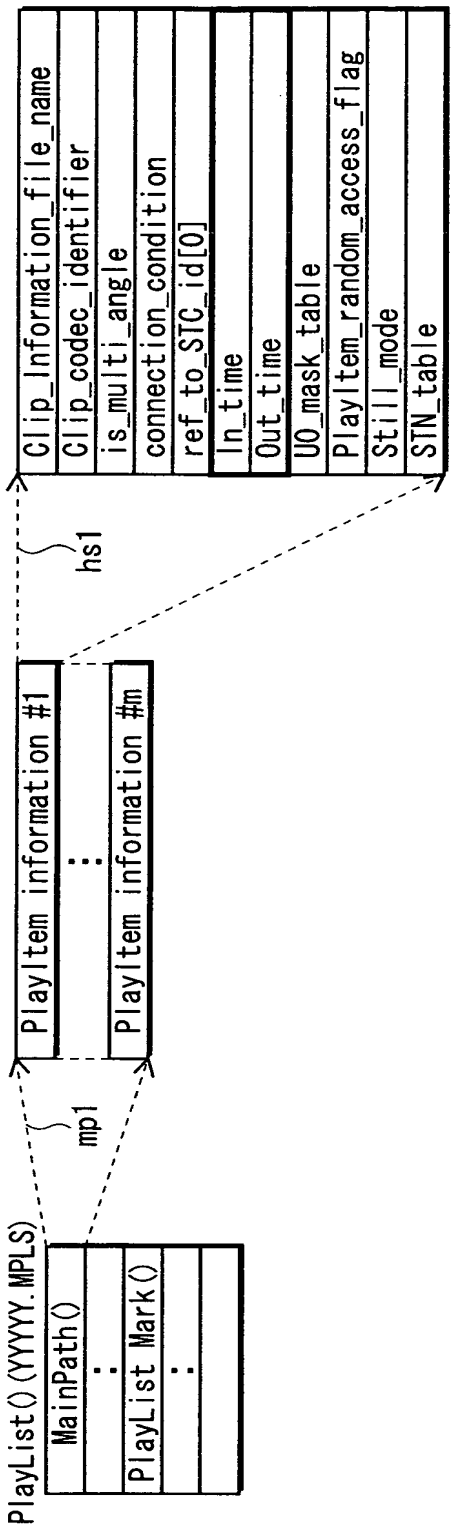
PlayList() (YYYYY.MPLS)
MainPath()
PlayList Mark()
mp1
PlayItem information #1
PlayItem information #m
hs1
Clip_Information_file_name
Clip_codec_identifier
is_multi_angle
connection_condition
ref_to_STC_id[0]
In_time
Out_time
UO_mask_table
PlayItem_random_access_flag
Still_mode
STN_table

FIG. 11

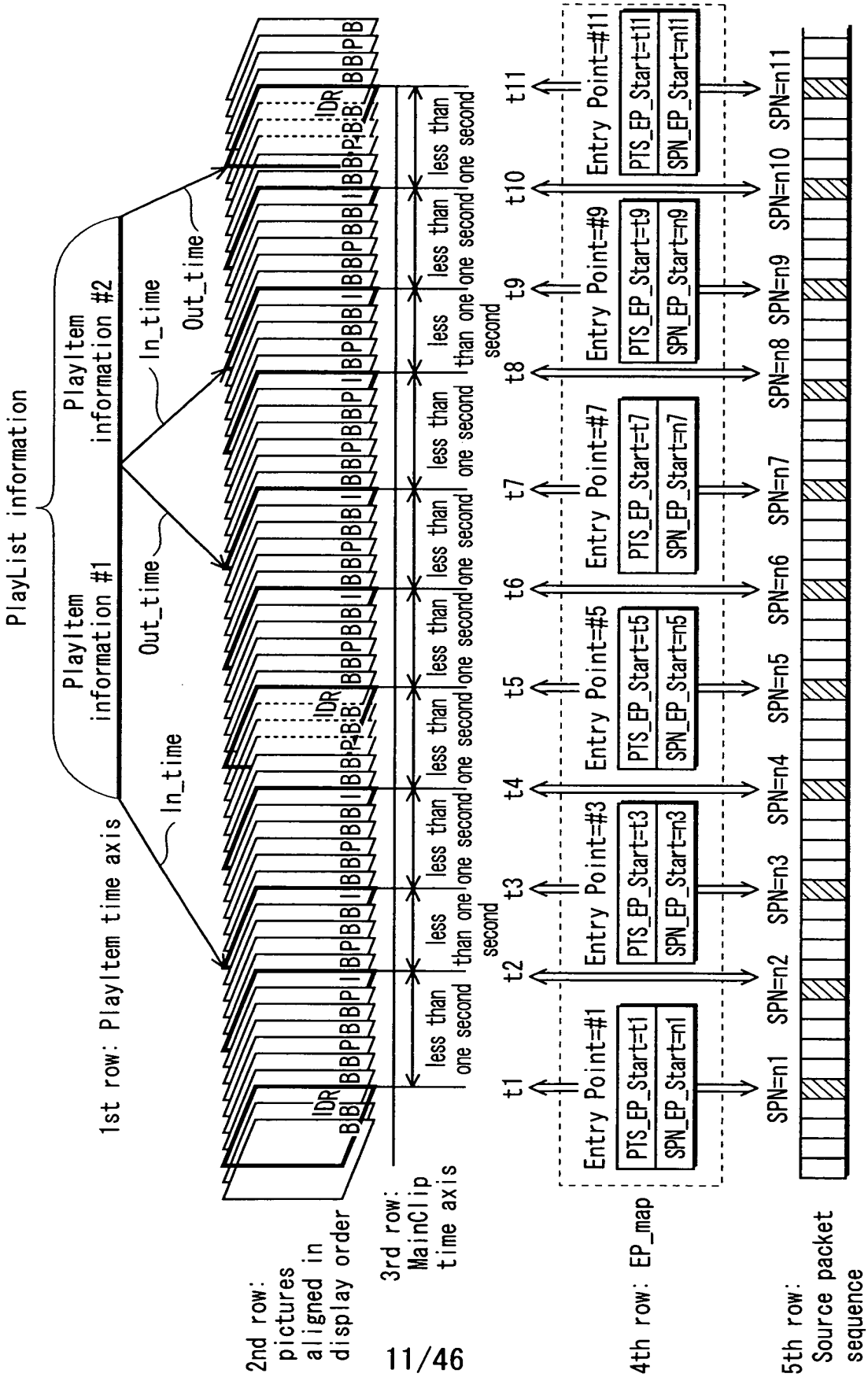
PlayList information
PlayItem information #1
PlayItem information #2
1st row: PlayItem time axis
In_time
Out_time
In_time
Out_time
2nd row: pictures aligned in display order
3rd row: MainClip time axis
less than one second
less than one second
less than one second

FIG. 12

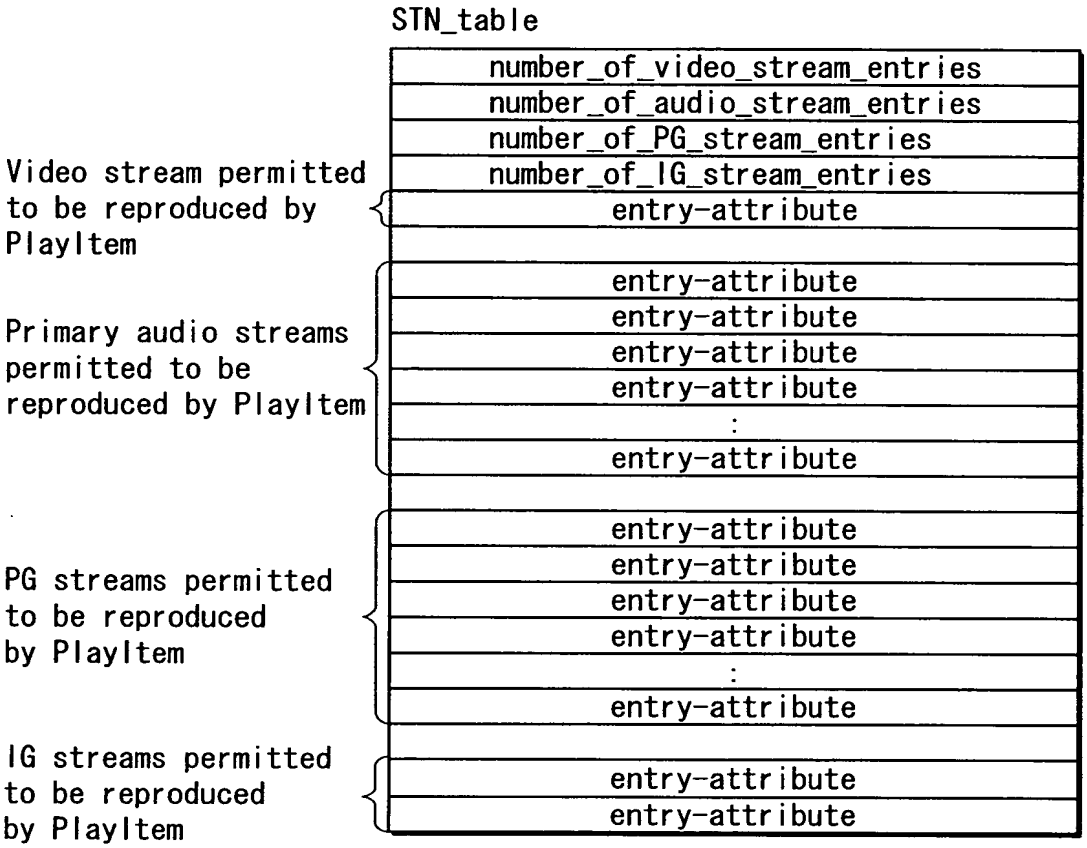
STN_table
number_of_video_stream_entries
number_of_audio_stream_entries
number_of_PG_stream_entries
number_of_IG_stream_entries
Video stream permitted to be reproduced by PlayItem
entry-attribute
Primary audio streams permitted to be reproduced by PlayItem
entry-attribute
entry-attribute
entry-attribute
entry-attribute
:
entry-attribute
PG streams permitted to be reproduced by PlayItem
entry-attribute
entry-attribute
entry-attribute
entry-attribute
:
entry-attribute
IG streams permitted to be reproduced by PlayItem
entry-attribute
entry-attribute

FIG. 13A

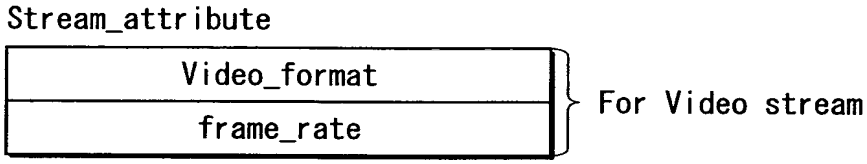

FIG. 13B

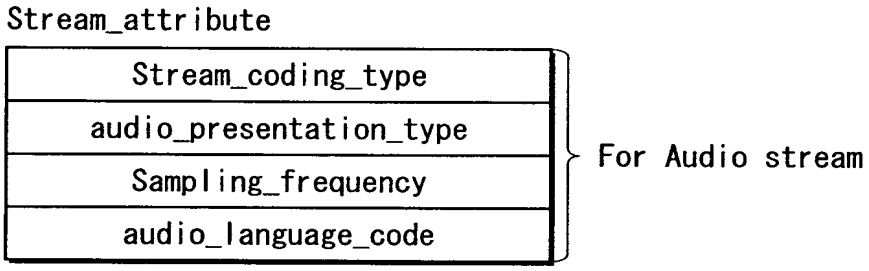

FIG. 13C

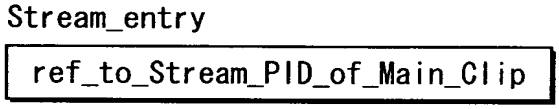

FIG. 14

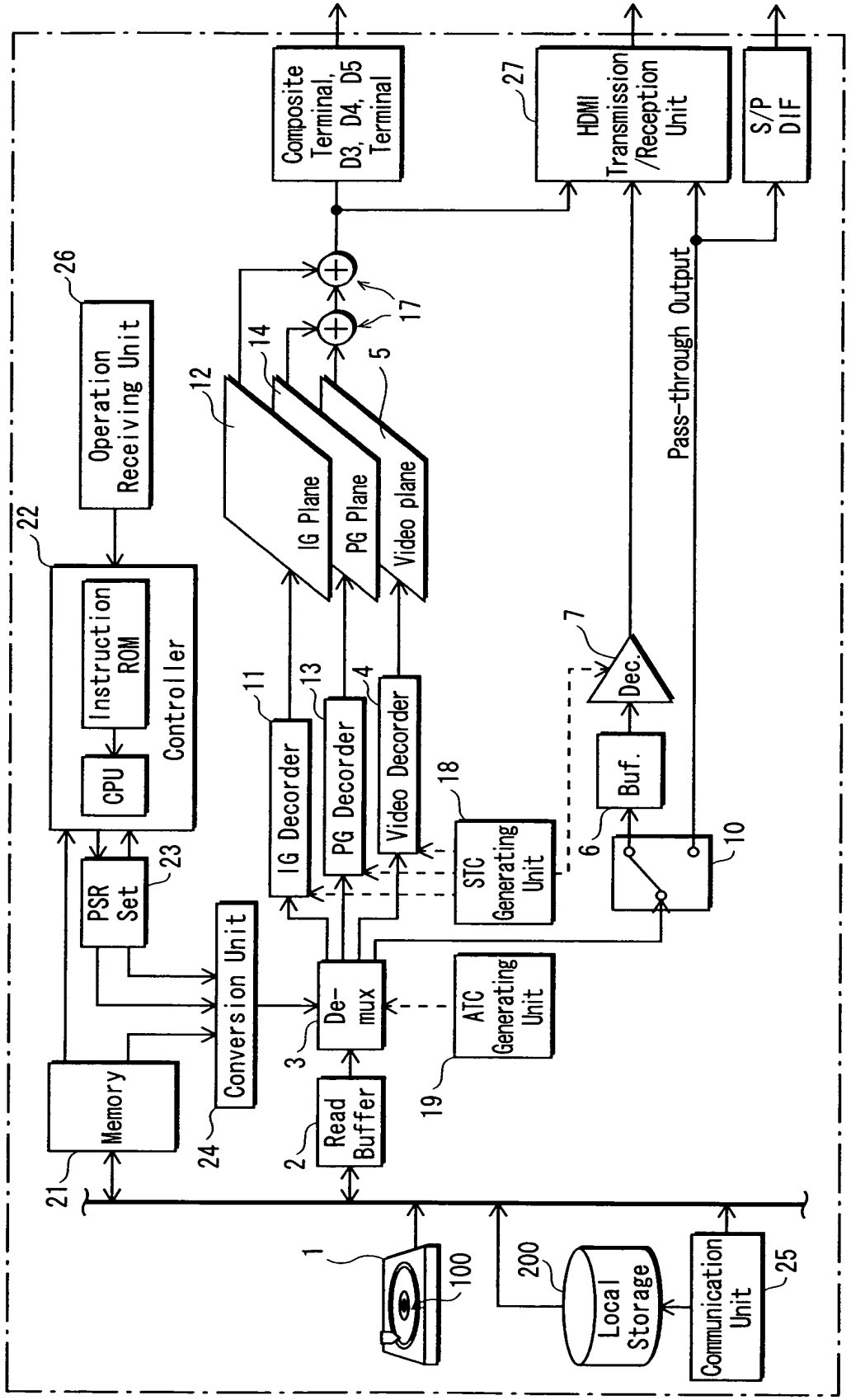
Composite Terminal, D3, D4, D5 Terminal
HDMI Transmission /Reception Unit
S/P DIF
Pass-through Output
Operation Receiving Unit
Instruction ROM
CPU
Controller
IG Plane
PG Plane
Video plane
IG Decorder
PG Decorder
Video Decorder
Dec.
Buf.
STC Generating Unit
ATC Generating Unit
PSR Set
Conversion Unit
De-mux
Read Buffer
Memory
Local Storage
Communication Unit
1
100
200
2
3
4
5
6
7
10
11
12
13
14
17
18
19
21
22
23
24
25
26
27

FIG. 15

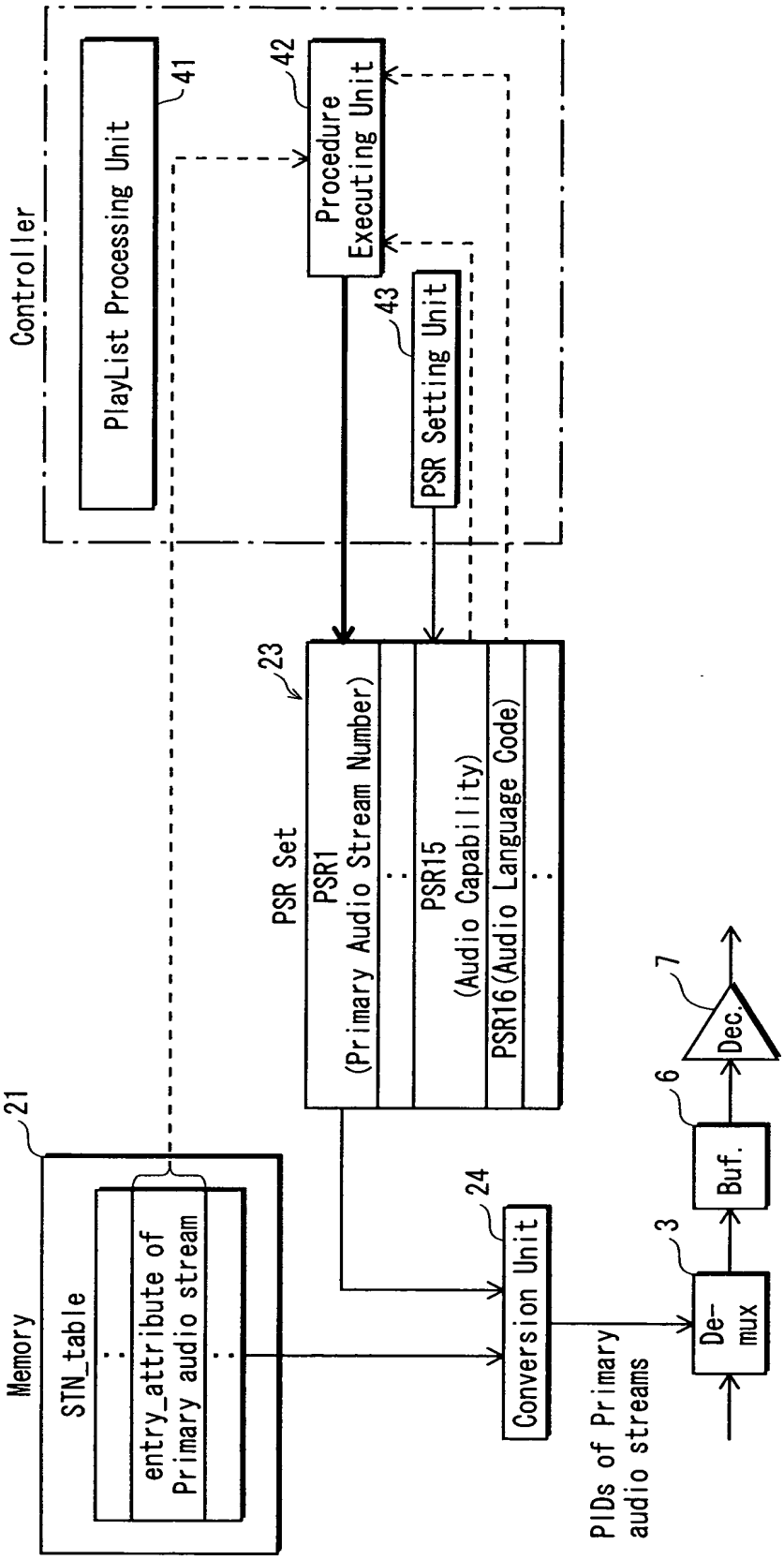
Controller
PlayList Processing Unit
41
Procedure Executing Unit
42
PSR Setting Unit
43
PSR Set
23
PSR1
(Primary Audio Stream Number)
PSR15
(Audio Capability)
PSR16(Audio Language Code)
21
Memory
STN_table
entry_attribute of Primary audio stream
24
Conversion Unit
3
De-mux
6
Buf.
7
Dec
PIDs of Primary audio streams

FIG. 16A

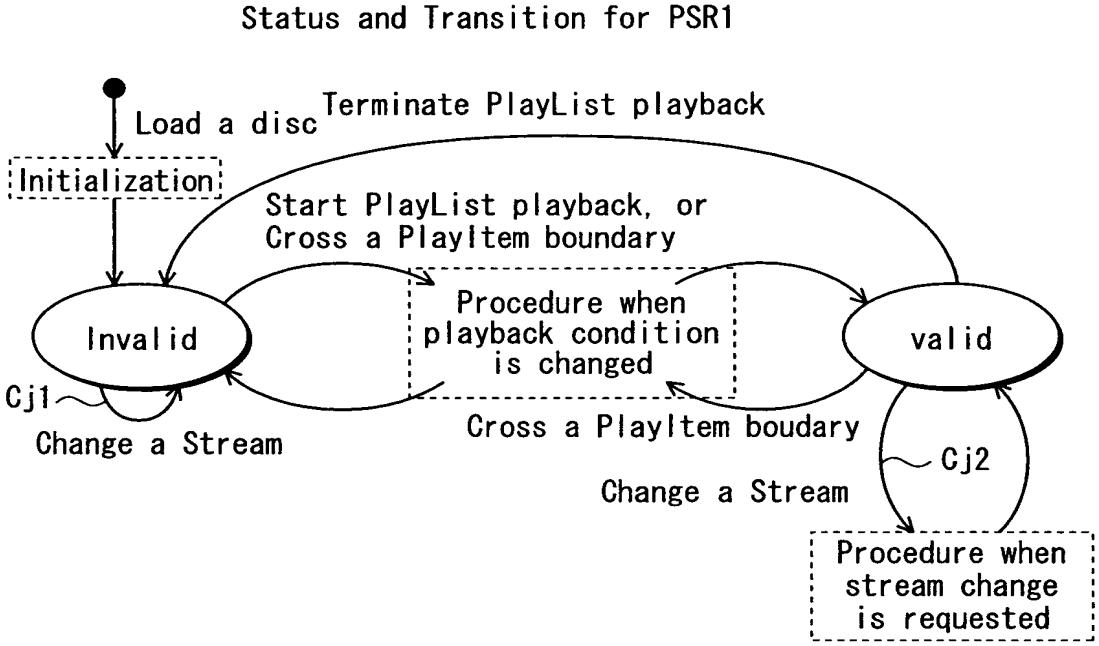

FIG. 16B

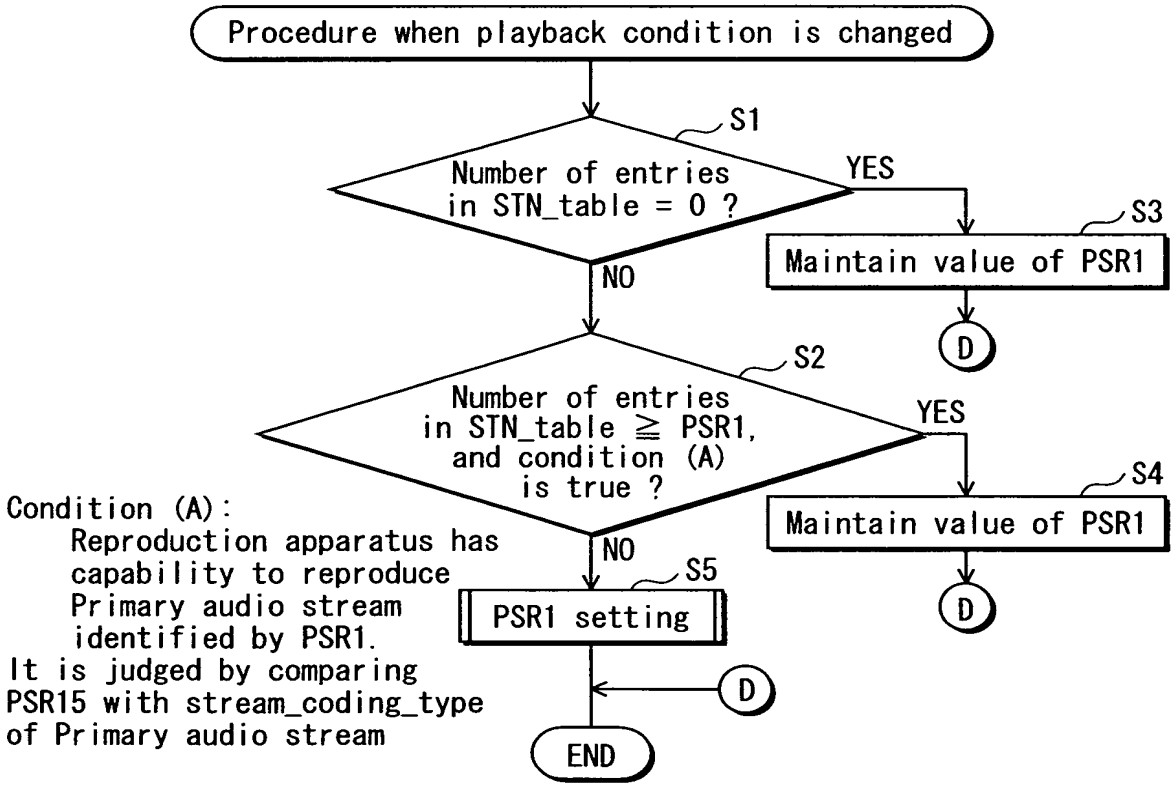

FIG. 17

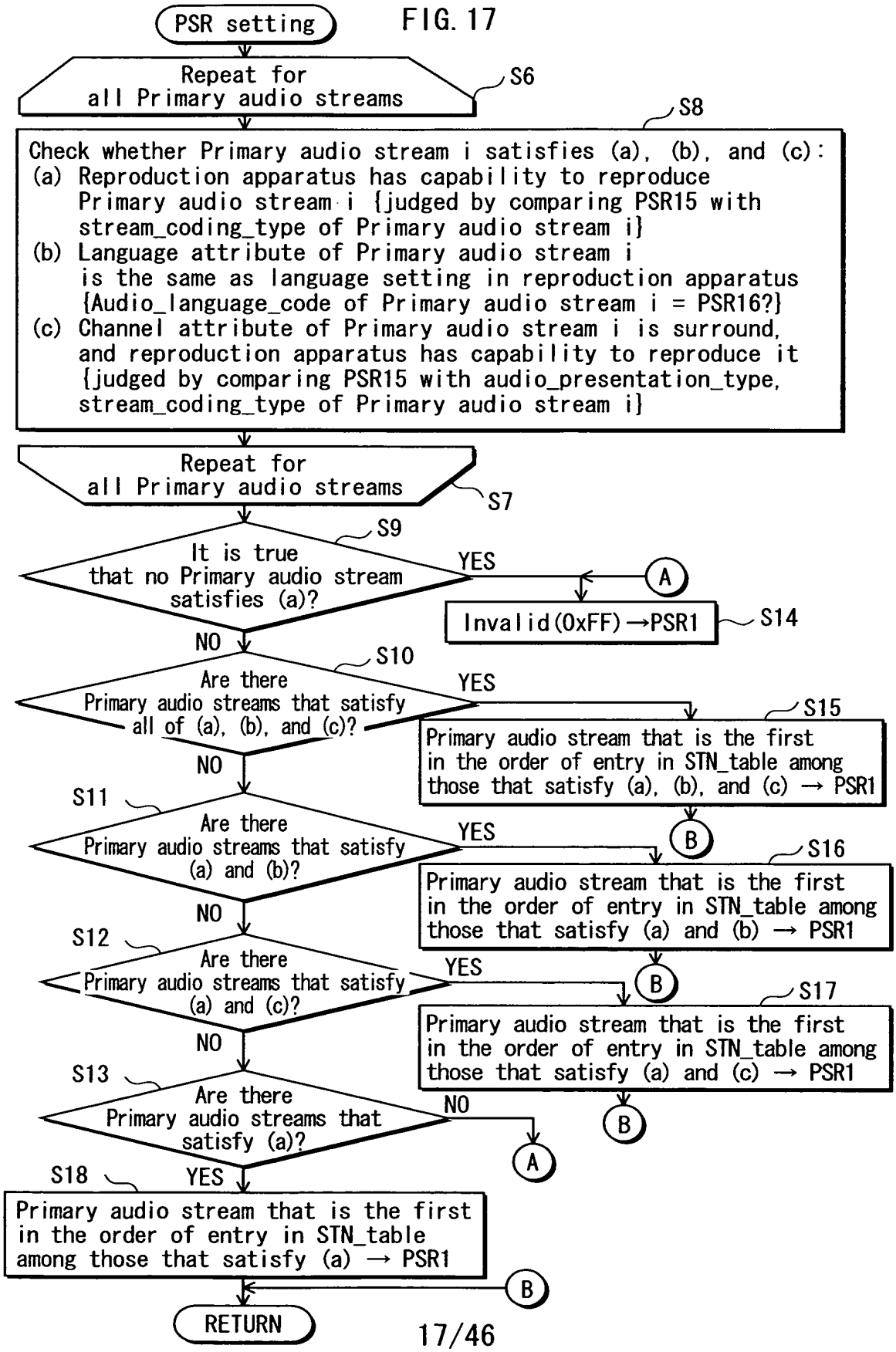
PSR setting
Repeat for all Primary audio streams
S6
S8
Check whether Primary audio stream i satisfies (a), (b), and (c):
(a) Reproduction apparatus has capability to reproduce Primary audio stream i {judged by comparing PSR15 with stream_coding_type of Primary audio stream i}
(b) Language attribute of Primary audio stream i is the same as language setting in reproduction apparatus {Audio_language_code of Primary audio stream i = PSR16?}
(c) Channel attribute of Primary audio stream i is surround, and reproduction apparatus has capability to reproduce it {judged by comparing PSR15 with audio_presentation_type, stream_coding_type of Primary audio stream i}
Repeat for all Primary audio streams
S7
S9
It is true that no Primary audio stream satisfies (a)?
YES
A
Invalid(0xFF)→PSR1
S14
NO
S10
Are there Primary audio streams that satisfy all of (a), (b), and (c)?
YES
S15
Primary audio stream that is the first in the order of entry in STN_table among those that satisfy (a), (b), and (c) → PSR1
NO
S11
Are there Primary audio streams that satisfy (a) and (b)?
YES
B
S16
Primary audio stream that is the first in the order of entry in STN_table among those that satisfy (a) and (b) → PSR1
NO
S12
Are there Primary audio streams that satisfy (a) and (c)?
YES
B
S17
Primary audio stream that is the first in the order of entry in STN_table among those that satisfy (a) and (c) → PSR1
NO
S13
Are there Primary audio streams that satisfy (a)?
NO
A
B
S18
YES
Primary audio stream that is the first in the order of entry in STN_table among those that satisfy (a) → PSR1
B
RETURN

FIG. 18

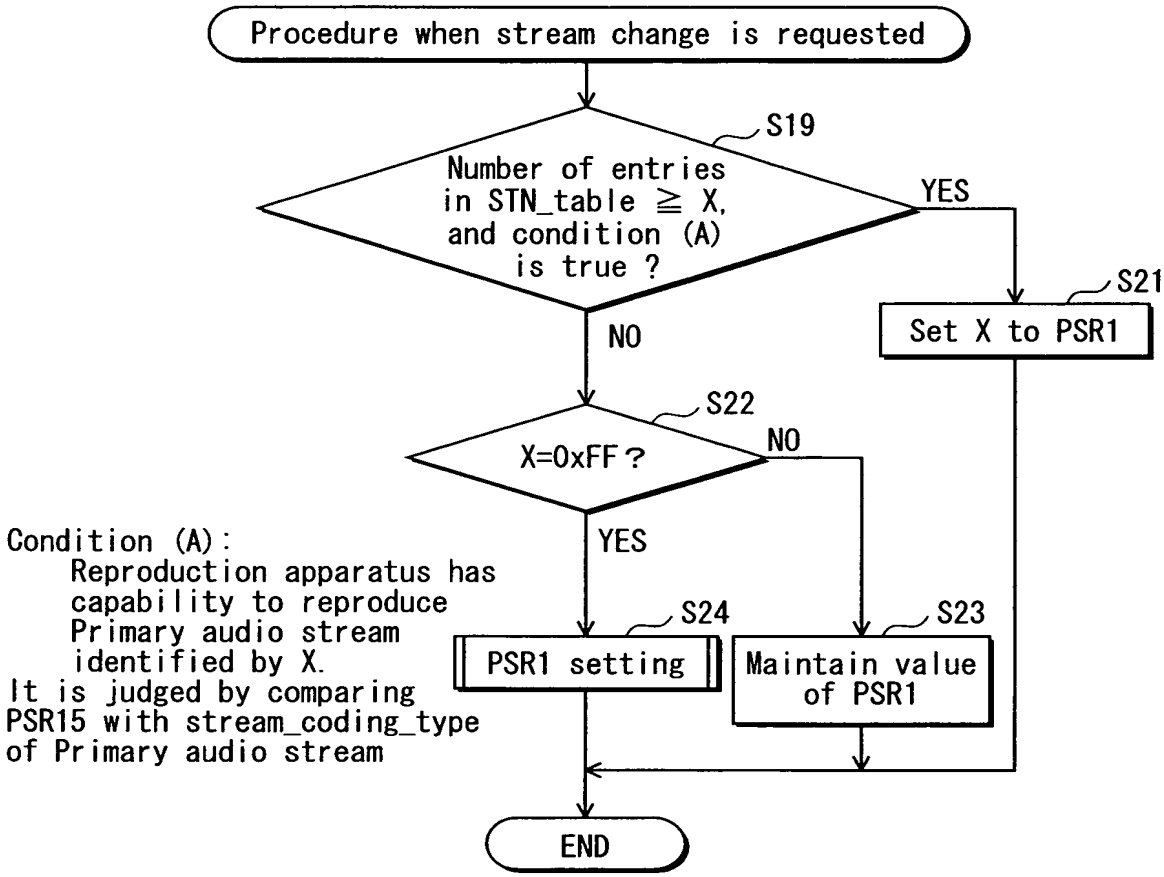
Procedure when stream change is requested
S19
Number of entries in STN_table ≧ X, and condition (A) is true ?
YES
NO
S21
Set X to PSR1
S22
X=0xFF ?
NO
YES
S24
PSR1 setting
S23
Maintain value of PSR1
END
Condition (A):
Reproduction apparatus has capability to reproduce Primary audio stream identified by X.
It is judged by comparing PSR15 with stream_coding_type of Primary audio stream

FIG. 19A

Presentation Capability(PSR 15) = LPCM ○ DD/DD+ ○ DTS-HD ×
Language setting(PSR 16) = Japanese
Surroud Capability(PSR 15) = Yes

FIG. 19B

Audio Stream 1	DD/DD+	2ch	English
Audio Stream 2	DD/DD+	5.1ch	English
Audio Stream 3	DTS-HD	5.1ch	English
Audio Stream 4	DD/DD+	2ch	Japanese
Audio Stream 5	DD/DD+	5.1ch	Japanese
Audio Stream 6	DTS-HD	5.1ch	Japanese

FIG. 19C

	Codec	Channel	Language	Check Presentation capability(a)	Check language (b)	Check surround Capability(c)	Priority
Audio Stream 1	DD/DD+	2ch	English	○	×	×	4
Audio Stream 2	DD/DD+	5.1ch	English	○	×	○	3
Audio Stream 3	DTS-HD	5.1ch	English	×	—	—	—
Audio Stream 4	DD/DD+	2ch	Japanese	○	○	×	2
Audio Stream 5	DD/DD+	5.1ch	Japanese	○	○	○	1
Audio Stream 6	DTS-HD	5.1ch	Japanese	×	—	—	—

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FIG. 20

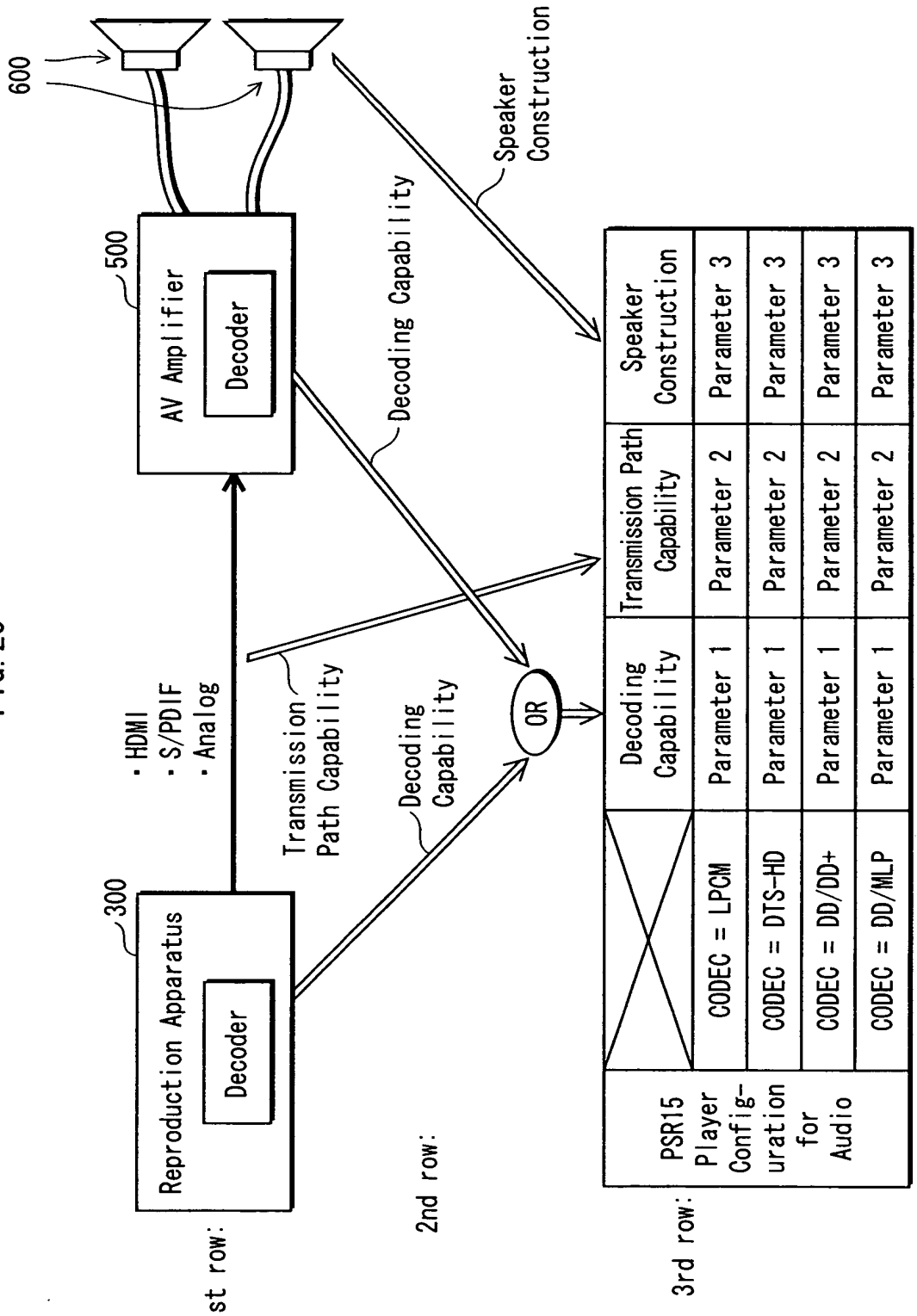
600
500
AV Amplifier
Decoder
300
Reproduction Apparatus
Decoder
・HDMI
・S/PDIF
・Analog
Transmission Path Capability
Decoding Capability
Decoding Capability
Speaker Construction
OR
1st row:
2nd row:
3rd row:
PSR15 Player Configuration for Audio
Decoding Capability
Transmission Path Capability
Speaker Construction
CODEC = LPCM
CODEC = DTS-HD
CODEC = DD/DD+
CODEC = DD/MLP
Parameter 1
Parameter 2
Parameter 3

FIG. 21A

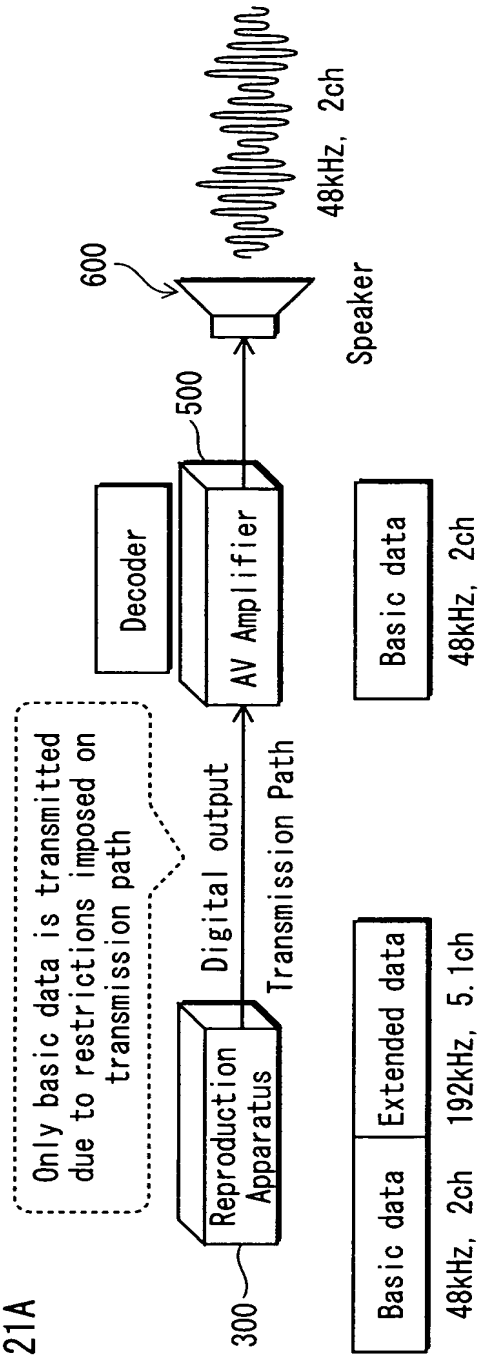

FIG. 21B

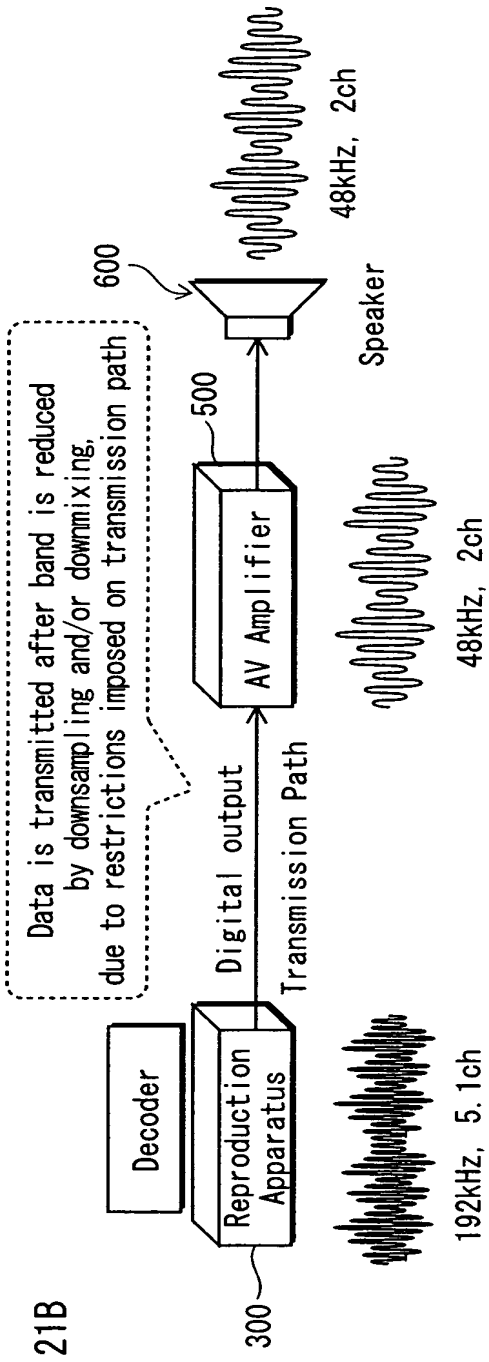

FIG. 22

Transmission Path / Stream	S/PDIF	HDMI	Analog
LPCM	Up to 48kHz/16bit/2ch	Up to 192kHz/24bit/8ch	Depend on player
DTS	Output capable	Output as LPCM (output capable: note 1)	
DTS-HD	Only core substream (corresponding to DTS)	Output as LPCM (output capable: note 1)	
DD(AC-3)	Output capable	Output as LPCM (output capable: note 1)	
DD/DD+	Only DD portion	Output as LPCM (output capable: note 1)	
DD/MLP	Only DD portion	Output as LPCM (output capable: note 1)	

Note 1: It can be transmitted in the form of compressed data after HDMI standard is extended in future

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FIG. 23A

PSR15

	Decoding Capability	Transmission Path Capability	Speaker Construction
CODEC = LPCM	Parameter 1	Parameter 2	Parameter 3

FIG. 23B

	Definition Column	Note Column
Decoding Capability :	Either 48/96kHz or 48/96/192kHz, as decoding capability for LPCM	Values of kHz, number of bits, and number of channels up to which LPCM can be decoded
Transmission Path Capability :	Whether transmission with three or more channels (surround) is capable	Values of kHz, number of bits, and number of channels up to which LPCM can be transmitted
Speaker Construction :	Whether surround output is capable	Whether surround output is capable

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FIG. 24A

PSR15

	Decoding Capability	Transmission Path Capability	Speaker Construction
CODEC = DTS-HD	Parameter 1	Parameter 2	Parameter 3

FIG. 24B

	Definition Column	Note Column
Decoding Capability :	Whether only DTS and Core Substream of DTS-HD can be decoded or Extension Substream can also be decoded	• Whether DTS audio can be decoded, • Whether Core Substream of DTS-HD can be decoded • Whether Extension Substream of DTS-HD can be decoded • Whether Lossless data can be decoded
Transmission Path Capability :	Whether Extension substream can be transmitted	Whether Extension substream can be transmitted
Speaker Construction :	Whether surround output is capable	Whether surround output is capable

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FIG. 25A

PSR15

	Decoding Capability	Transmission Path Capability	Speaker Construction
CODEC = DD/DD+	Parameter 1	Parameter 2	Parameter 3

FIG. 25B

	Definition Column	Note Column
Decoding Capability :	Whether only DD and DD portion of DD/DD+ can be decoded or DD+ portion can also be decoded	• Whether DD (AC-3) can be decoded, • Whether DD portion of DD/DD+ can be decoded • Whether DD+ portion of DD/DD+ can be decoded
Transmission Path Capability :	Whether DD+ portion (Substream) of DD/DD+ can be transmitted	Whether DD+ portion (Substream) of DD/DD+ can be transmitted
Speaker Construction :	Whether surround output is capable	Whether surround output is capable

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FIG. 26A

PSR15

	Decoding Capability	Transmission Path Capability	Speaker Construction
CODEC = DD/MLP	Parameter 1	Parameter 2	Parameter 3

FIG. 26B

	Definition Column	Note Column
Decoding Capability :	Whether only DD and DD portion of DD/MLP can be decoded or MLP portion can also be decoded	• Whether DD (AC-3) can be decoded, • Whether DD portion of DD/MLP can be decoded • Whether MLP portion of DD/MLP can be decoded
Transmission Path Capability :	Whether MLP portion (Substream) of DD/MLP can be transmitted	Whether MLP portion (Substream) of DD/MLP can be transmitted
Speaker Construction :	Whether surround output is capable	Whether surround output is capable

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FIG. 27A

PSR15

	Decoding Capability	Transmission Path Capability	Speaker Construction
CODEC = DD/DD+	Parameter 1a	Parameter 2	Parameter 3
CODEC = DD/MLP	Parameter 1b		

FIG. 27B

	Definition Column	Note Column
Decoding Capability :	Whether only DD and DD portion of DD/DD+ or DD/MLP can be decoded or DD+ or MLP portion can also be decoded	• Whether DD (AC-3) can be decoded, • Whether DD portion of DD/DD+ or DD/MLP can be decoded • Whether DD+ portion of DD/DD+ can be decoded • Whether MLP portion of DD/MLP can be decoded
Transmission Path Capability :	Whether DD+ or MLP portion (Substream) of DD/DD+ or DD/MLP can be transmitted	Whether DD+ or MLP portion (Substream) of DD/DD+ or DD/MLP can be transmitted
Speaker Construction :	Whether surround output is capable	Whether surround output is capable

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FIG. 28

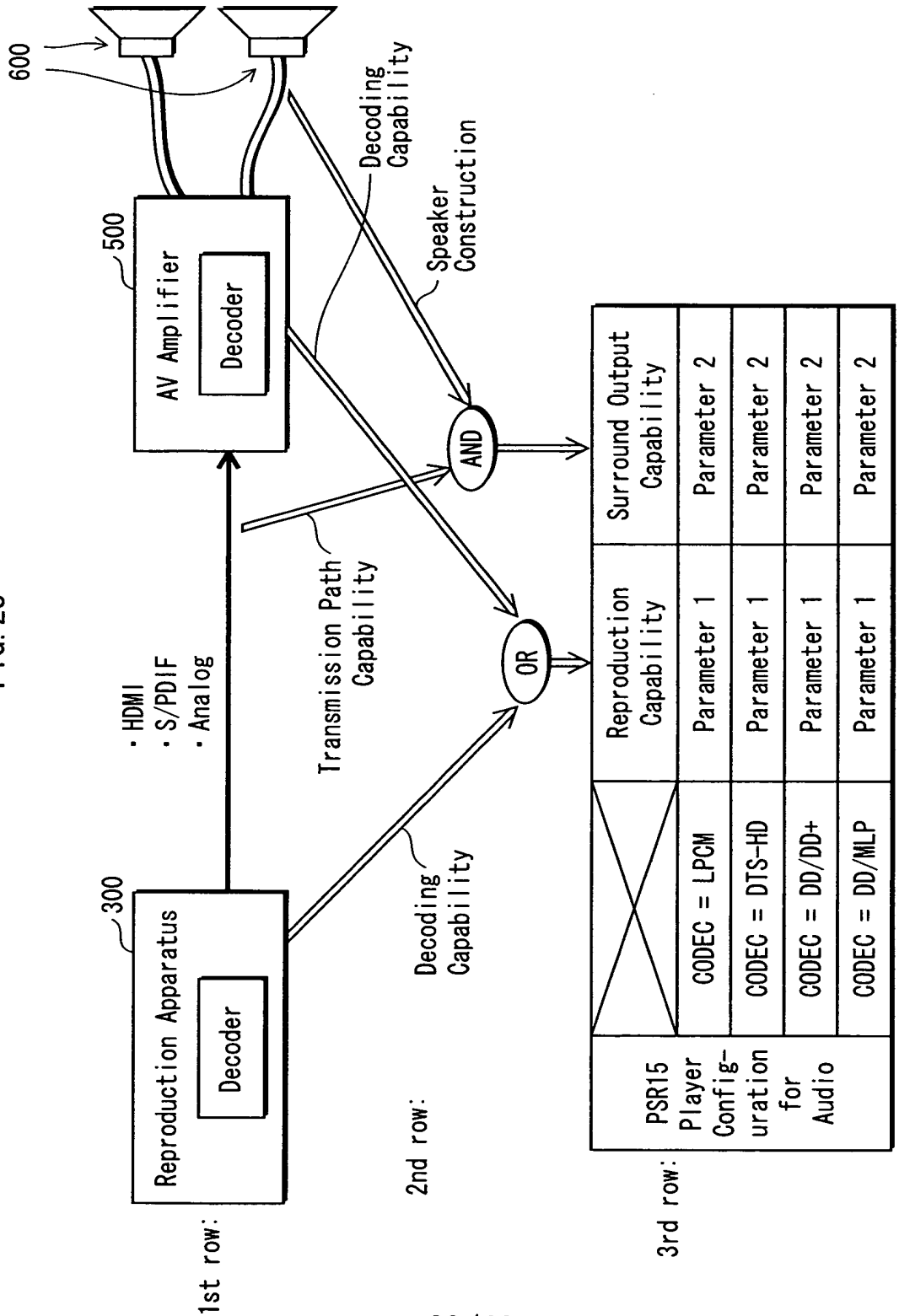
600
500
AV Amplifier
Decoder
Decoding Capability
Speaker Construction
AND
Transmission Path Capability
OR
300
Reproduction Apparatus
Decoder
・HDMI
・S/PDIF
・Analog
Decoding Capability
1st row:
2nd row:
3rd row:
PSR15 Player Configuration for Audio
Reproduction Capability
Surround Output Capability
CODEC = LPCM
CODEC = DTS-HD
CODEC = DD/DD+
CODEC = DD/MLP
Parameter 1
Parameter 2

FIG. 29A

PSR15

	Reproduction Capability = Decoding Capability	Surround Output Capability = Speaker Construction AND Transmission Path Capability
CODEC = LPCM	Parameter 1	Parameter 2

FIG. 29B

		Transmission Path Capability	
		Transmission capable with only 2 channels	Transmission capable with up to 8 channels
Speaker Construction	Two or less	Only stereo output	Only stereo output
	Three or more, or virtual surround can be achieved	Only stereo output	Surround output capable

Values to be set in Parameter 2

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FIG. 30

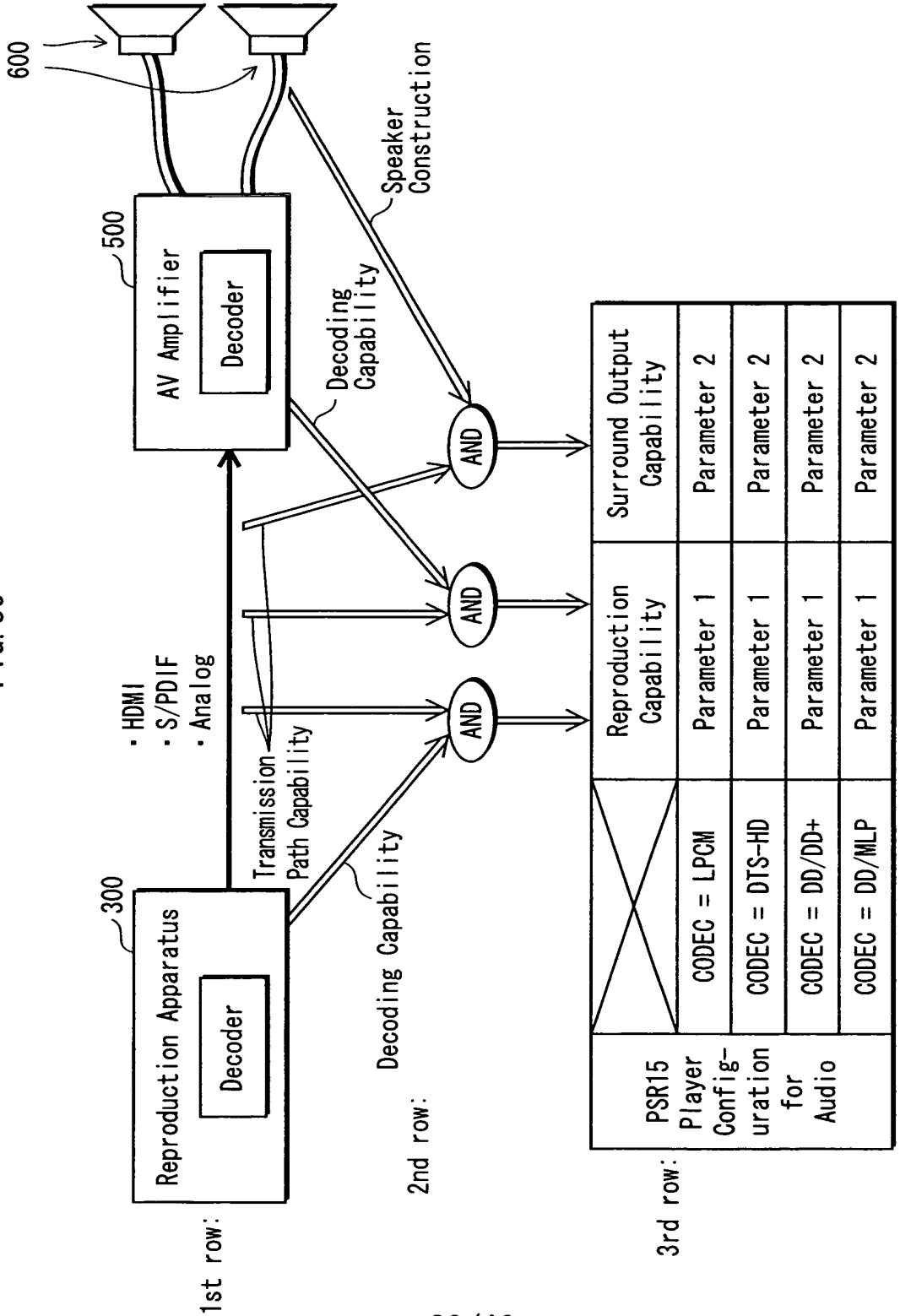
600
500
AV Amplifier
Decoder
Speaker Construction
Decoding Capability
300
Reproduction Apparatus
Decoder
• HDMI
• S/PDIF
• Analog
Transmission Path Capability
Decoding Capability
AND
AND
AND
1st row:
2nd row:
3rd row:
PSR15 Player Config-uration for Audio
Reproduction Capability
Surround Output Capability
CODEC = LPCM
CODEC = DTS-HD
CODEC = DD/DD+
CODEC = DD/MLP
Parameter 1
Parameter 2

FIG. 31A

PSR15

	Reproduction Capability = Decoding Capability AND Transmission Path Capability	Surround Output Capability = Speaker Construction AND Transmission Path Capability
CODEC = LPCM	Parameter 1	Parameter 2

FIG. 31B

		Transmission Path Capability	
		Transmission capable at 48kHz	Transmission capable at 192kHz
Decoding Capability	Decoding for 48kHz/96kHz is capable	48kHz LPCM is transmitted as it is, 96kHz LPCM is subjected to downsampling before transmission → reproduction of 48kHz/96kHz LPCM capable	Reproduction of 48kHz/96kHz LPCM capable
	Decoding for 192kHz is also capable	48kHz LPCM is transmitted as it is, 96kHz/192kHz LPCM is subjected to downsampling before transmission → reproduction capable	Reproduction capable

Values to be set in Parameter 1

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FIG. 32

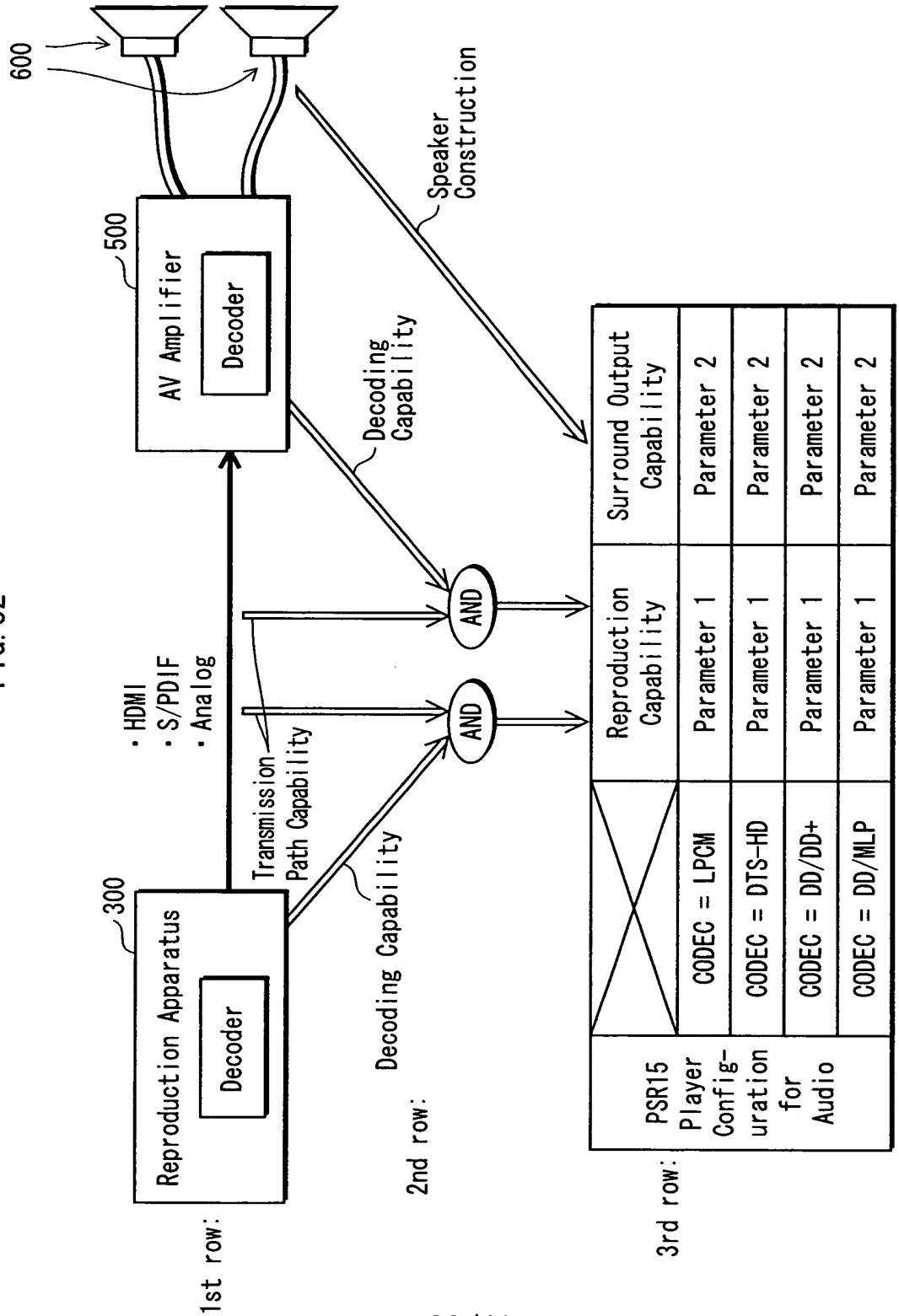
600
500
AV Amplifier
Decoder
Speaker Construction
Decoding Capability
AND
AND
• HDMI
• S/PDIF
• Analog
Transmission Path Capability
300
Reproduction Apparatus
Decoder
Decoding Capability
1st row:
2nd row:
3rd row:
PSR15 Player Configuration for Audio
Reproduction Capability
Surround Output Capability
CODEC = LPCM
CODEC = DTS-HD
CODEC = DD/DD+
CODEC = DD/MLP
Parameter 1
Parameter 2

FIG. 33A

PSR15

	Reproduction Capability = Decoding Capability AND Transmission Path Capability	Surround Output Capability = Speaker Construction
CODEC = DTS CODEC = DTS-HD	Parameter 1	Parameter 2

FIG. 33B

		Transmission Path Capability	
		Transmission of DTS Stream and Core Substream capable	Transmission of Extension Substream also capable
Decoding Capability	Decoding incapable	Reproduction incapable	Reproduction incapable
	Decoding of DTS and Core Substream of DTS-HD capable	Reproduction of DTS and Core Substream of DTS-HD capable	Reproduction of DTS and Core Substream of DTS-HD capable
	Decoding of Extension Substream of DTS-HD also capable	Reproduction of DTS and Core Substream of DTS-HD capable	Reproduction of DTS and DTS-HD capable

Values to be set in Parameter 1

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FIG. 34A

PSR15

	Reproduction Capability = Decoding Capability AND Transmission Path Capability	Surround Output Capability = Speaker Construction
CODEC = DD(AC-3) CODEC = DD/DD+	Parameter 1	Parameter 2

FIG. 34B

		Transmission Path Capability	
		Transmission of DD and DD portion of DD/DD+ capable	Transmission of DD+ portion of DD/DD+ also capable
Decoding Capability	Decoding incapable	Reproduction incapable	Reproduction incapable
	Decoding of DD and DD portion of DD/DD+ capable	Reproduction of DD and DD portion of DD/DD+ capable	Reproduction of DD and DD portion of DD/DD+ capable
	Decoding of DD+ portion of DD/DD+ also capable	Reproduction of DD and DD portion of DD/DD+ capable	Reproduction of DD and DD/DD+ capable

Values to be set in Parameter 1

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FIG. 35A

PSR15

	Reproduction Capability = Decoding Capability AND Transmission Path Capability	Surround Output Capability = Speaker Construction
CODEC = DD(AC-3) CODEC = DD/MLP	Parameter 1	Parameter 2

FIG. 35B

		Transmission Path Capability	
		Transmission of DD and DD portion of DD/MLP capable	Transmission of MLP portion of DD/MLP also capable
Decoding Capability	Decoding incapable	Reproduction incapable	Reproduction incapable
	Decoding of DD and DD portion of DD/MLP capable	Reproduction of DD and DD portion of DD/MLP capable	Reproduction of DD and DD portion of DD/MLP capable
	Decoding of MLP portion of DD/MLP also capable	Reproduction of DD and DD portion of DD/MLP capable	Reproduction of DD and DD/MLP capable

Values to be set in Parameter 1

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FIG. 36

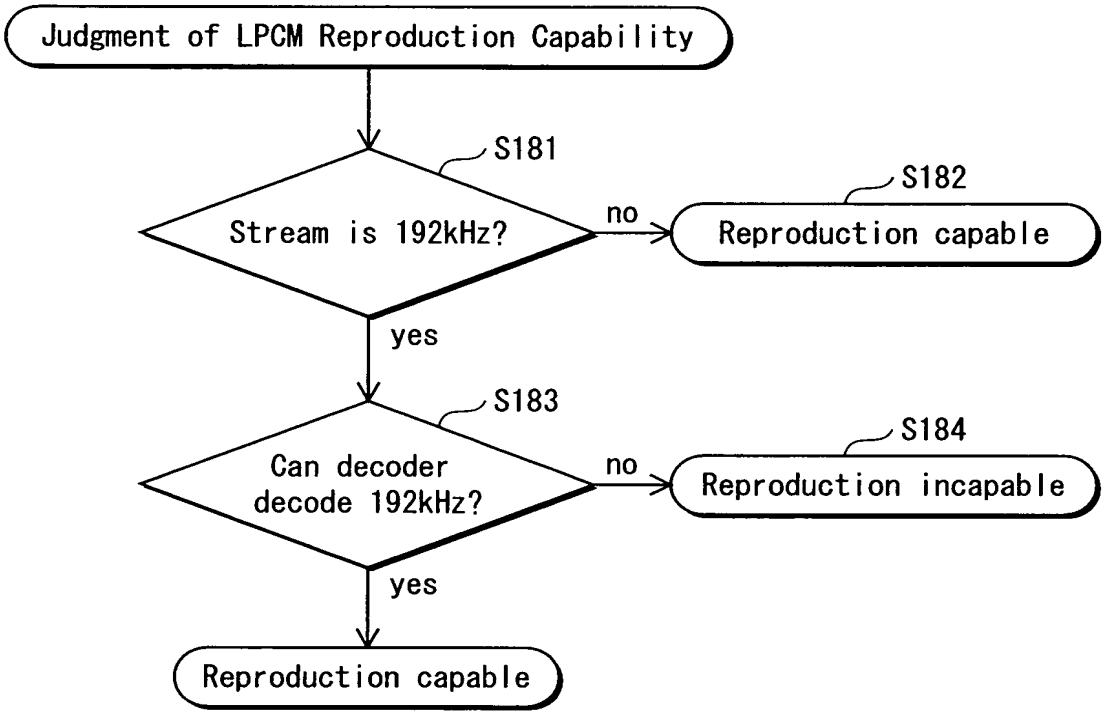
Judgment of LPCM Reproduction Capability
S181
Stream is 192kHz?
no
S182
Reproduction capable
yes
S183
Can decoder decode 192kHz?
no
S184
Reproduction incapable
yes
Reproduction capable

FIG. 37

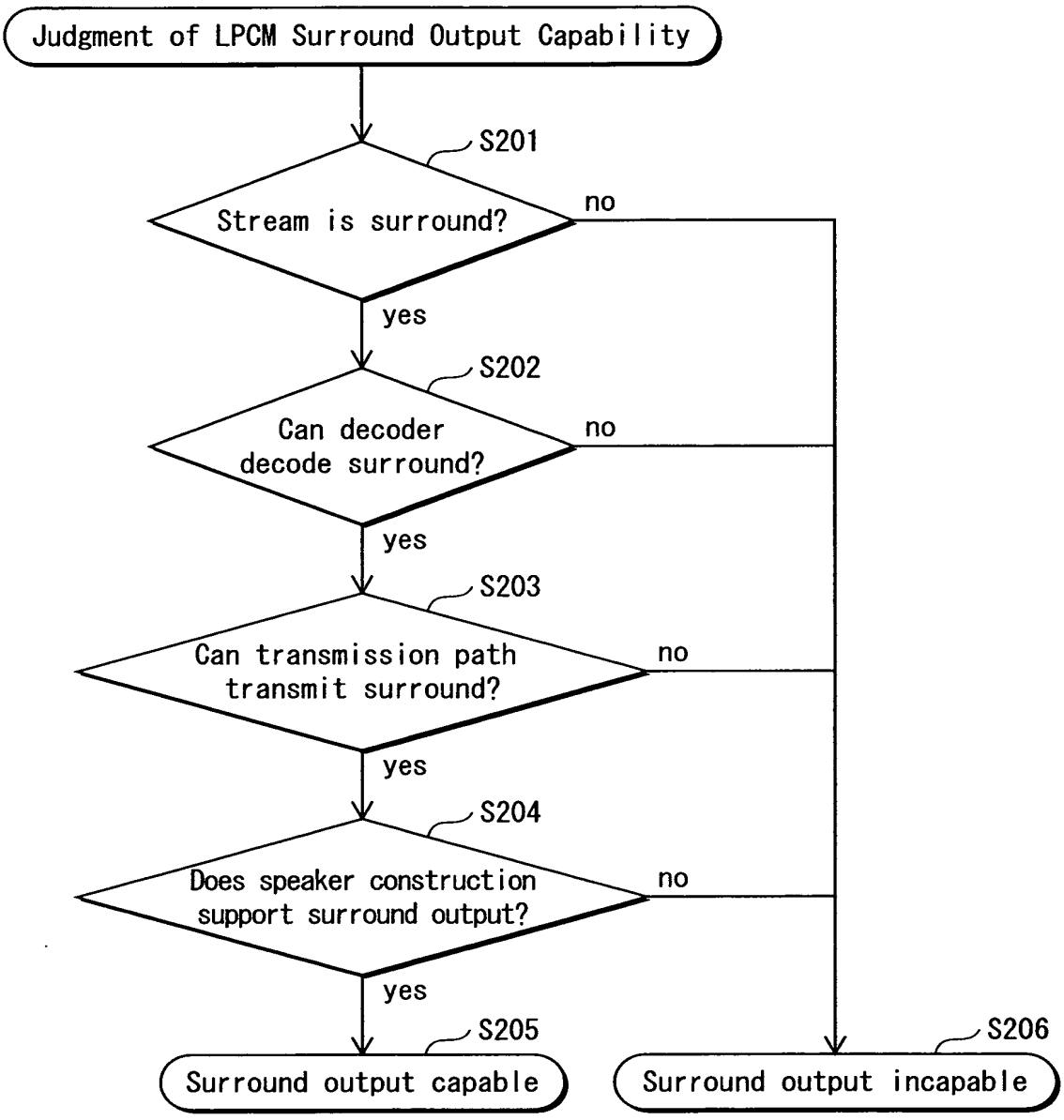
Judgment of LPCM Surround Output Capability
S201
Stream is surround?
no
yes
S202
Can decoder decode surround?
no
yes
S203
Can transmission path transmit surround?
no
yes
S204
Does speaker construction support surround output?
no
yes
S205
Surround output capable
S206
Surround output incapable

FIG. 38

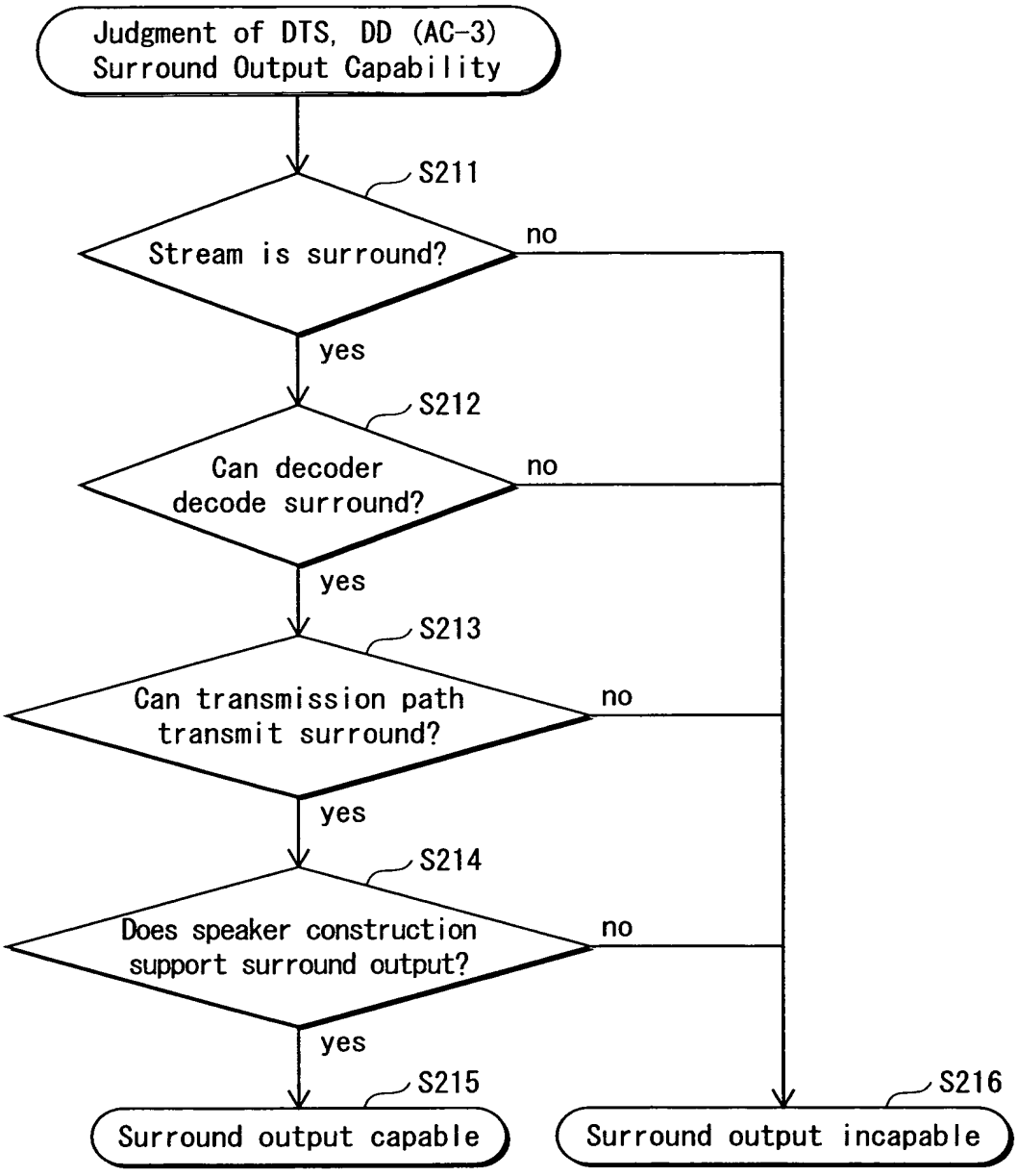
Judgment of DTS, DD (AC-3) Surround Output Capability
S211
Stream is surround?
no
yes
S212
Can decoder decode surround?
no
yes
S213
Can transmission path transmit surround?
no
yes
S214
Does speaker construction support surround output?
no
yes
S215
Surround output capable
S216
Surround output incapable

FIG. 39

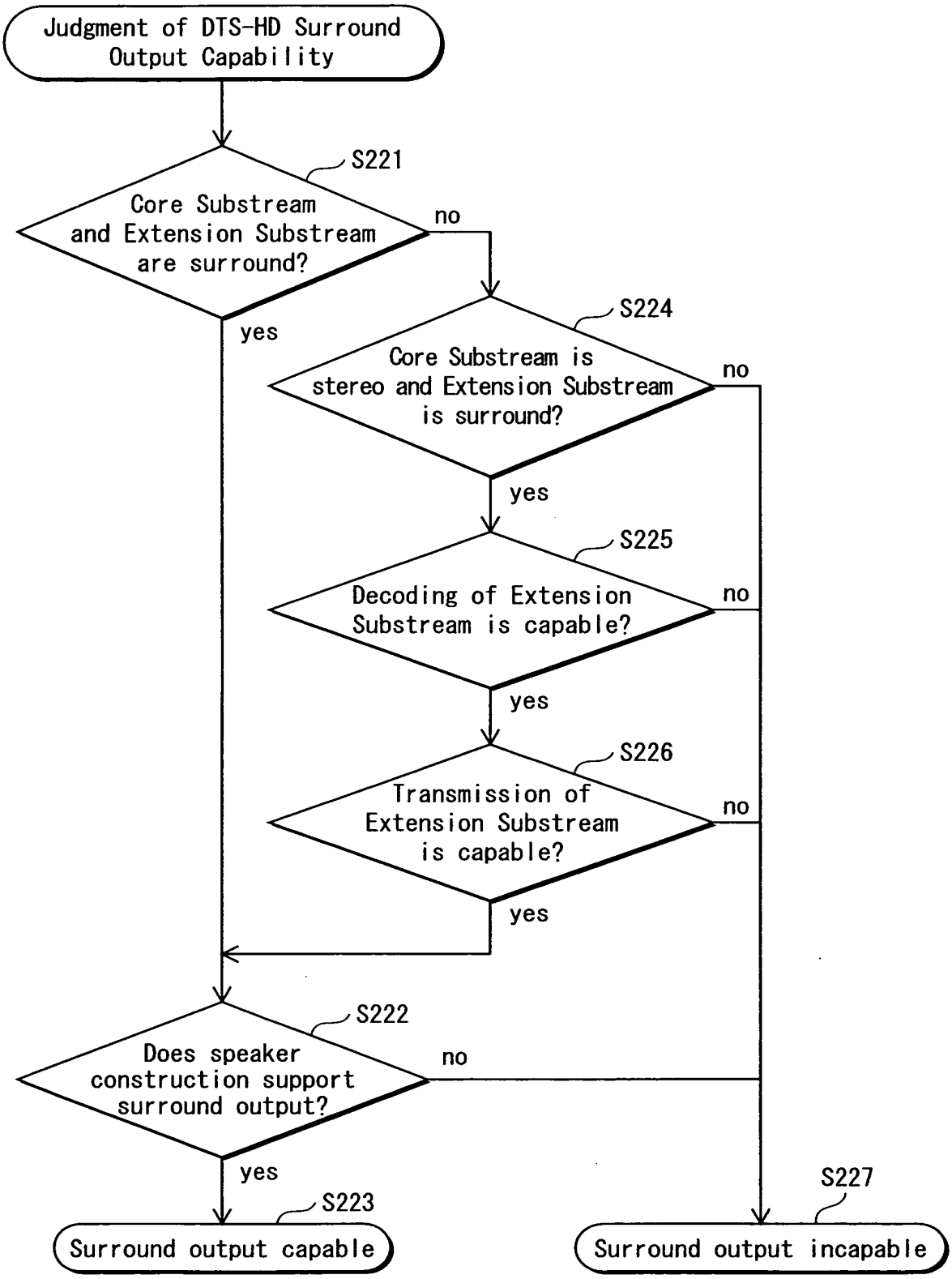
Judgment of DTS-HD Surround Output Capability
S221
Core Substream and Extension Substream are surround?
no
yes
S224
Core Substream is stereo and Extension Substream is surround?
no
yes
S225
Decoding of Extension Substream is capable?
no
yes
S226
Transmission of Extension Substream is capable?
no
yes
S222
Does speaker construction support surround output?
no
yes
S223
Surround output capable
S227
Surround output incapable

FIG. 40

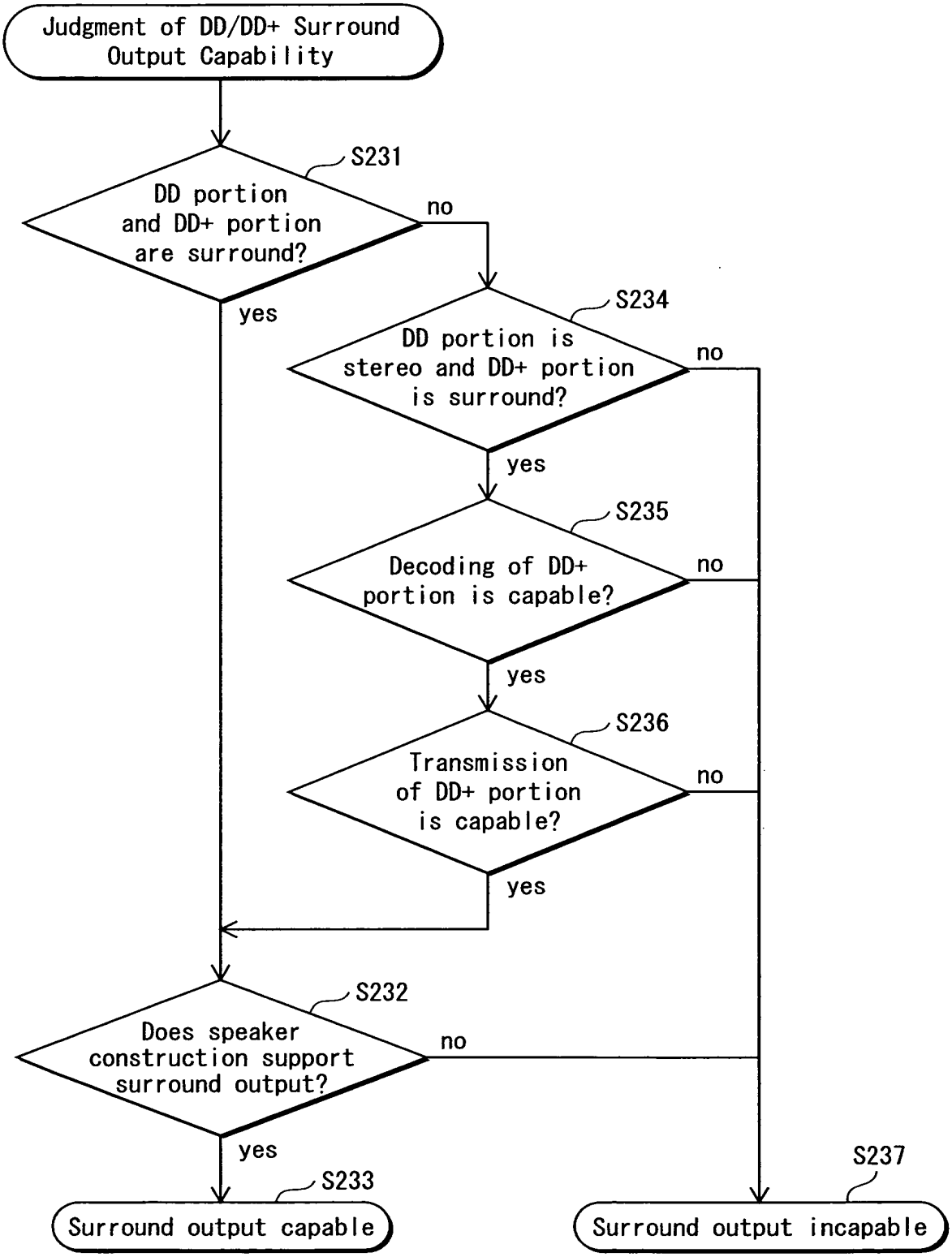
Judgment of DD/DD+ Surround Output Capability
S231
DD portion and DD+ portion are surround?
no
yes
S234
DD portion is stereo and DD+ portion is surround?
no
yes
S235
Decoding of DD+ portion is capable?
no
yes
S236
Transmission of DD+ portion is capable?
no
yes
S232
Does speaker construction support surround output?
no
yes
S233
Surround output capable
S237
Surround output incapable

FIG. 41

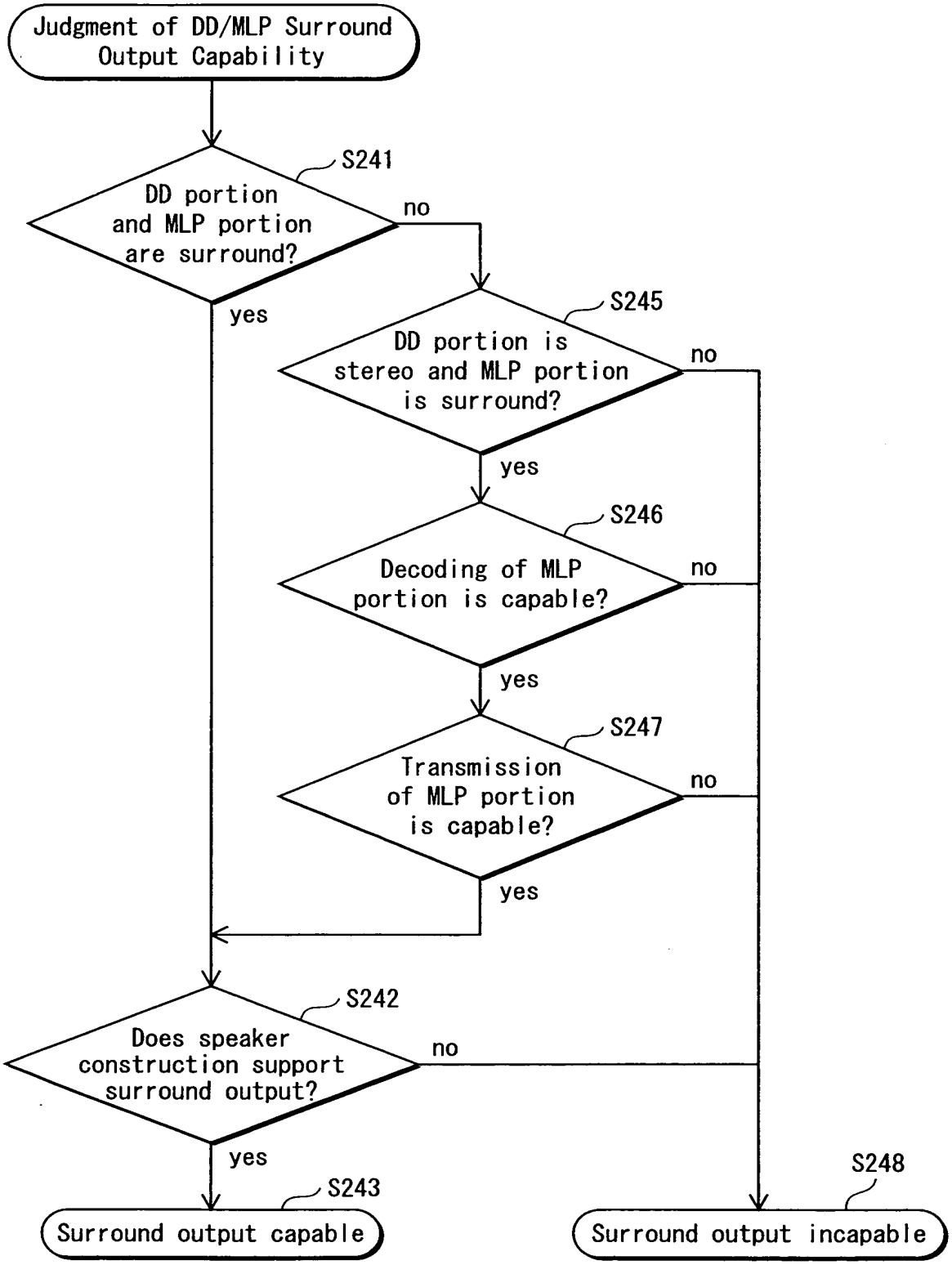
Judgment of DD/MLP Surround Output Capability
S241
DD portion and MLP portion are surround?
no
yes
S245
DD portion is stereo and MLP portion is surround?
no
yes
S246
Decoding of MLP portion is capable?
no
yes
S247
Transmission of MLP portion is capable?
no
yes
S242
Does speaker construction support surround output?
no
yes
S243
Surround output capable
S248
Surround output incapable

FIG. 42

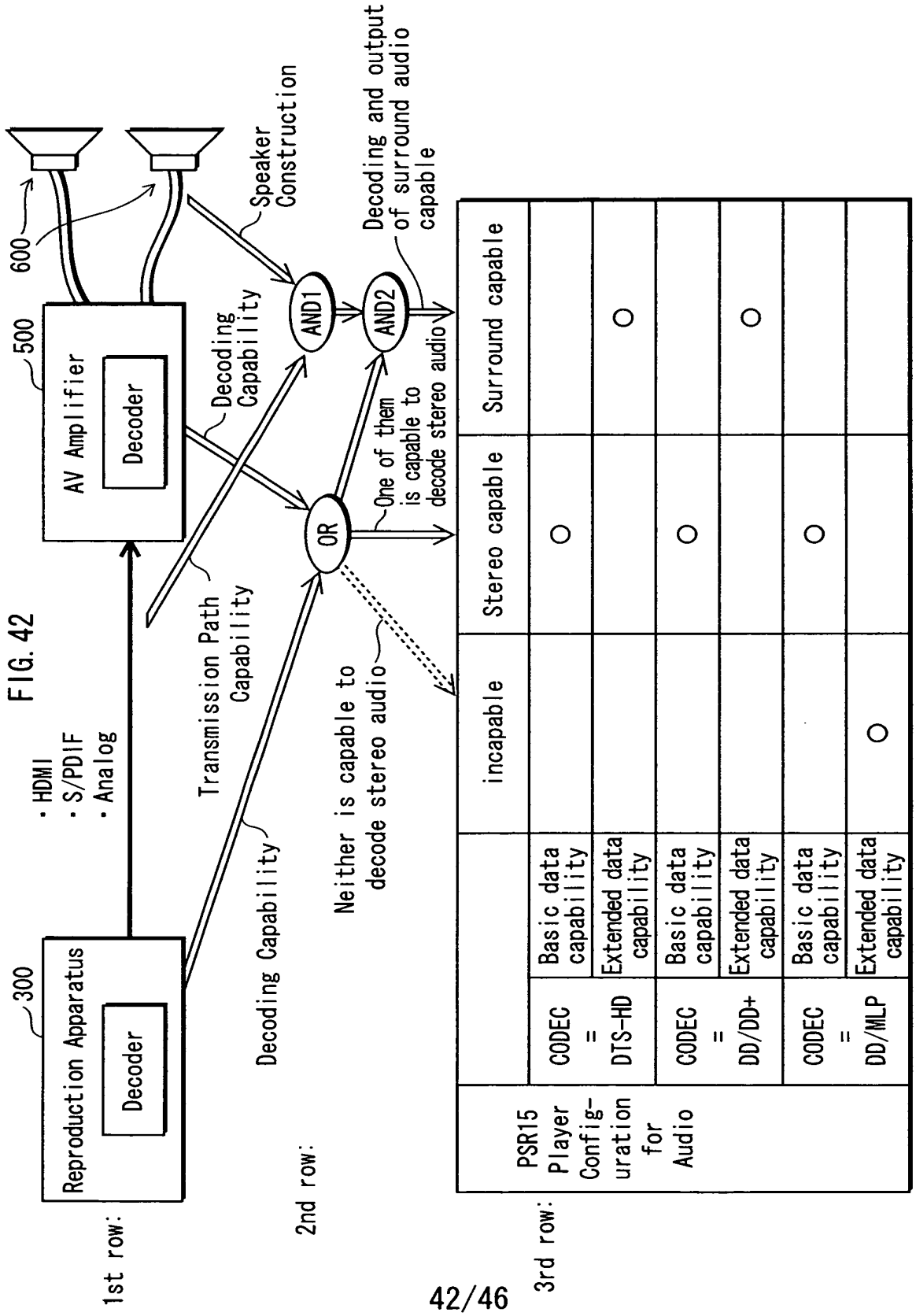
1st row:
300
Reproduction Apparatus
Decoder
• HDMI
• S/PDIF
• Analog
500
AV Amplifier
Decoder
600
Speaker Construction
2nd row:
Decoding Capability
Transmission Path Capability
Decoding Capability
AND1
AND2
OR
One of them is capable to decode stereo audio
Decoding and output of surround audio capable
Neither is capable to decode stereo audio
3rd row:
PSR15 Player Configuration for Audio
incapable
Stereo capable
Surround capable
CODEC = DTS-HD
CODEC = DD/DD+
CODEC = DD/MLP
Basic data capability
Extended data capability
○

FIG. 43

PSR15:Player Capability for Audio

b31	b30	b29	b28	b27	b26	b25	b24
reserved				reserved			
b23	b22	b21	b20	b19	b18	b17	b16
reserved				reserved			
b15	b14	b13	b12	b11	b10	b9	b8
DD/MLP				DTS-HD capability			
MLP audio		DD(AC-3)		Extension Substream		Core Substream	
b7	b6	b5	b4	b3	b2	b1	b0
DD/DD+ capability				LPCM capability			
Dependent substream		Independent substream					

LPCM capability ··· 0001b:Stereo capable for 48/96kHz
0010b:Surround capable for 48/96kHz
0101b:Stereo capable for all sampling frequency
0110b:Surround capable for all sampling frequency

Note:A second left bit specifies capability of decoding for 192kHz LPCM.

DD/DD+ capability

Independent substream (Dolby Digital)	···	01b:Stereo capable 10b:Surround capable
Dependent substream	···	00b:incapable 01b:Stereo capable 10b:Surround capable

DTS-HD capability

Core substream	···	01b:Stereo capable 10b:Surround capable
Extension substream	···	00b:incapable 01b:Stereo capable 10b:Surround capable

DD/MLP capability

DD(AC-3)	···	01b:Stereo capable 10b:Surround capable
MLP audio	···	00b:incapable 01b:Stereo capable 10b:Surround capable

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FIG. 44

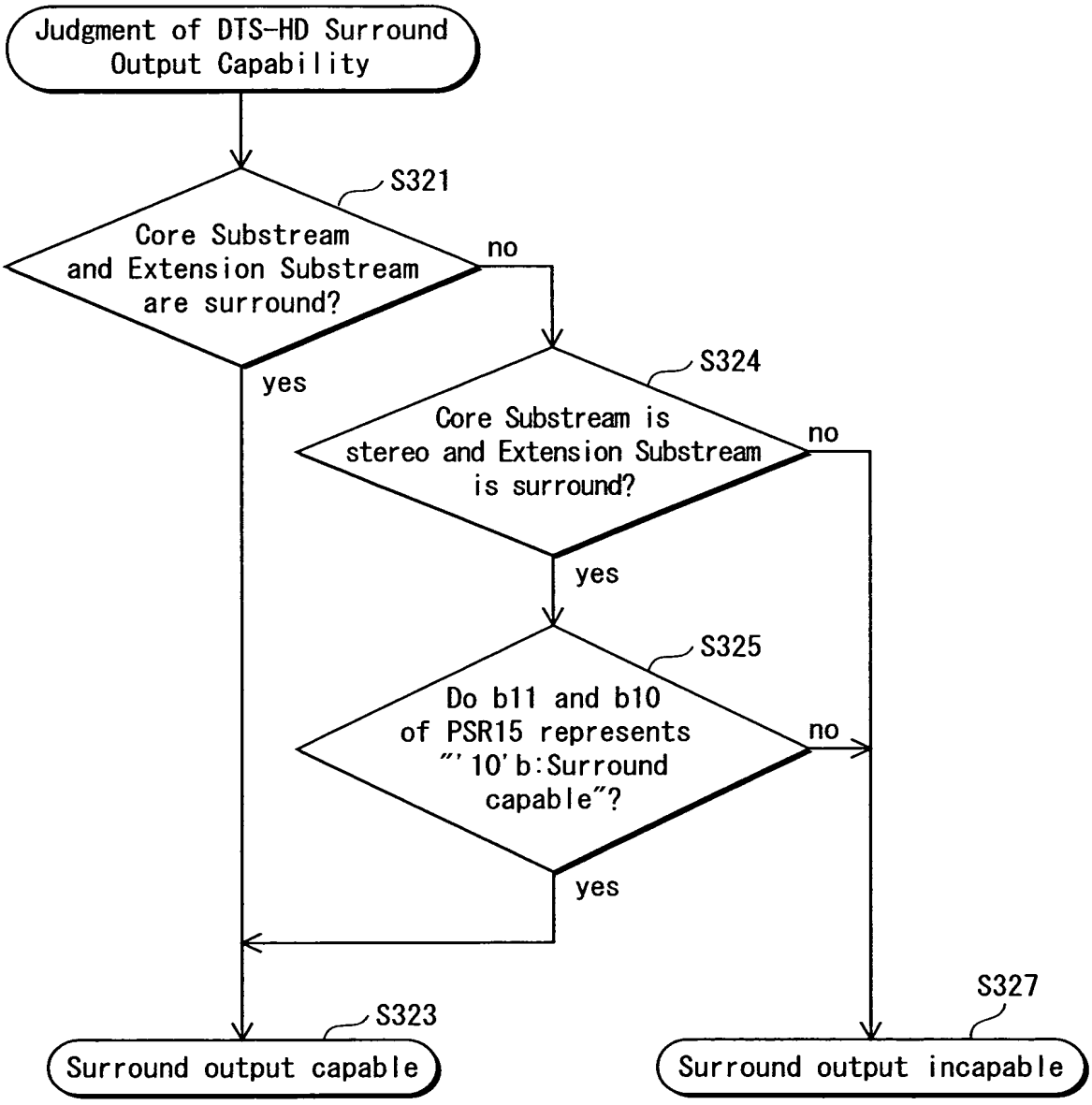

Judgment of DTS-HD Surround Output Capability
S321
Core Substream and Extension Substream are surround?
no
yes
S324
Core Substream is stereo and Extension Substream is surround?
no
yes
S325
Do b11 and b10 of PSR15 represents "'10'b:Surround capable"?
no
yes
S323
Surround output capable
S327
Surround output incapable

FIG. 45

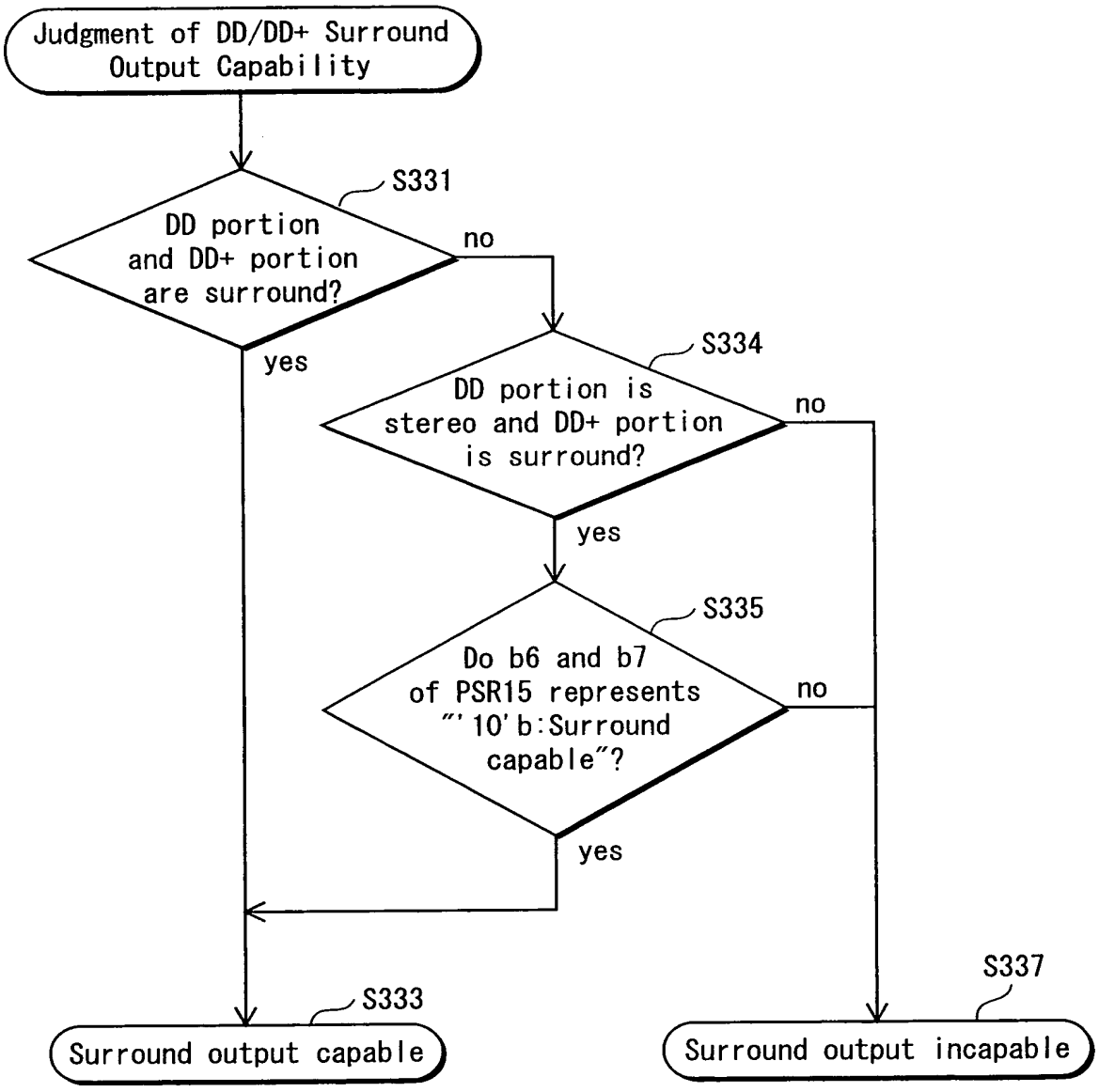
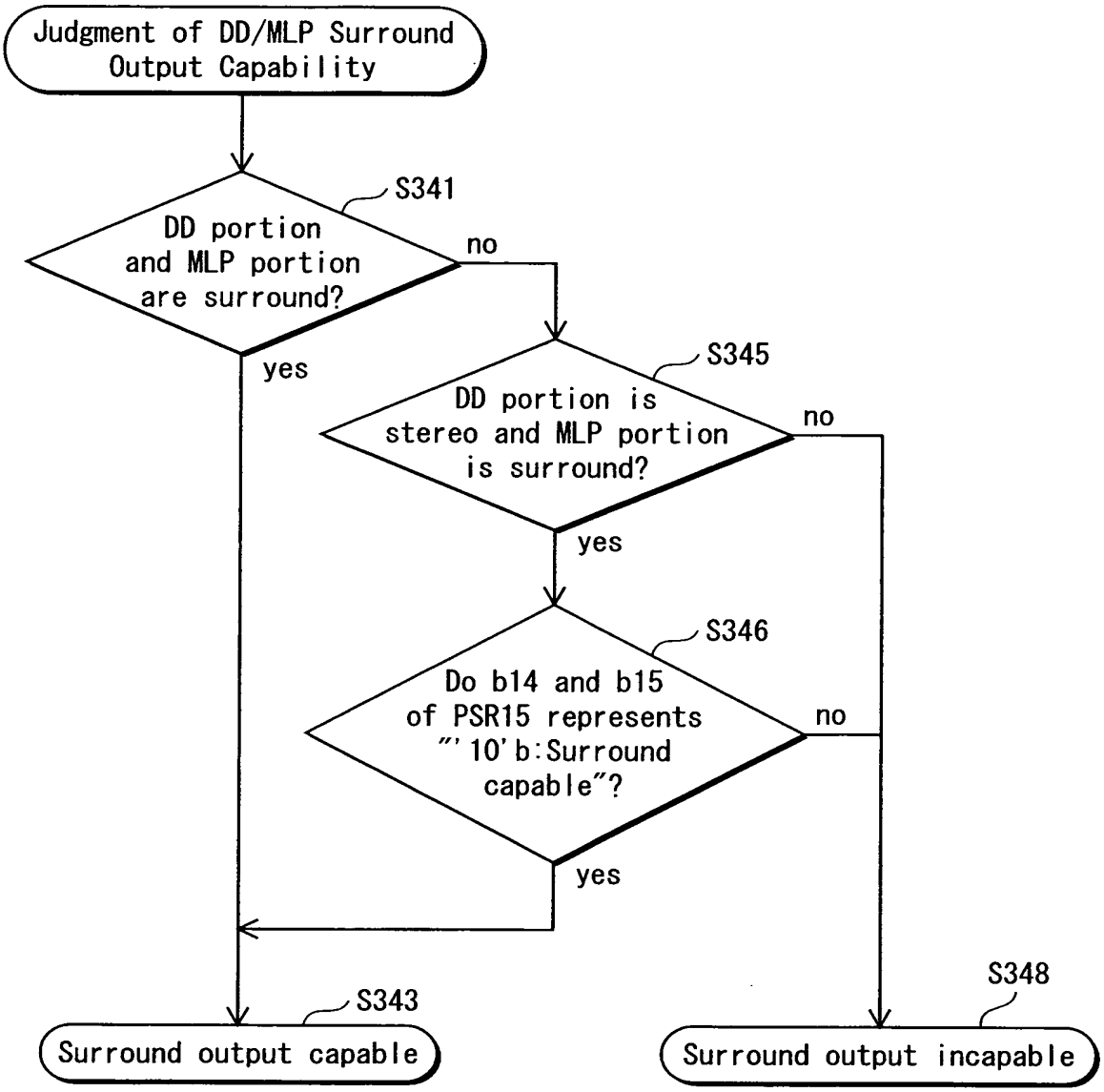

Judgment of DD/DD+ Surround Output Capability
S331
DD portion and DD+ portion are surround?
no
yes
S334
DD portion is stereo and DD+ portion is surround?
no
yes
S335
Do b6 and b7 of PSR15 represents "'10'b:Surround capable"?
no
yes
S333
Surround output capable
S337
Surround output incapable

FIG. 46


Judgment of DD/MLP Surround Output Capability
S341
DD portion and MLP portion are surround?
no
yes
S345
DD portion is stereo and MLP portion is surround?
no
yes
S346
Do b14 and b15 of PSR15 represents "'10'b:Surround capable"?
no
yes
S343
Surround output capable
S348
Surround output incapable